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JUNE 8TH, 1875.

Colonel A. LANE FOX, *President, in the Chair.*

The minutes of the last meeting were read and confirmed.

The election was announced of ROBERT PHILLIPS GREG, Jun., Esq., F.G.S., F.R.A.S., of Coles Park, Buntingford, Herts.

Thanks were voted for the following presents received :

FOR THE LIBRARY.

- From the AUTHOR.—Rude Stone Monuments. By Rev. W. C. Lukis, M.A.
- From the ROYAL GEOGRAPHICAL SOCIETY.—Arctic Papers for the Expedition of 1875.
- From the SOCIETY.—Bulletin de la Société Impériale des Naturalistes de Moscou. Vol. XLVIII. No. 3.
- From the EDITOR.—Revue Scientifique. Nos. 47 and 48. And Tables des Matières.
- From the ACADEMY.—Proceedings of the Royal Academy of Copenhagen. No. 2, 1874.
- From the SOCIETY.—Transactions of the Asiatic Society of Japan. Vol. III. Part 1.
- From the SOCIETY.—Mémoires de la Société Royale des Antiquaires du Nord. 1866.
- From the INSTITUTION.—Journal of the Royal United Service Institution. Vol. XVIII. (Appendix).
- From the AUTHOR.—United States Geological and Geographical Survey of Colorado, 1873. By F. V. Hayden.
- From the INSTITUTION.—Journal of the Royal Institution of Cornwall. Vol. XVI. 1874.
- From the EXECUTORS of the late HENRY CHRISTY.—Reliquiæ Aquitanicæ. Part XVI. 1875.

VOL. V.

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From the AUTHOR.—Illustrated Catalogue of the Canterbury Museum. By John Brent, F.S.A.

From Mrs. JACKSON.—Ethnology and Phrenology. Second edition. By the late J. W. Jackson.

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The following paper was read by the author :

*The LONG WALL of SALONA and the RUINED CITIES of PHARIA and GELSA DI LESINA.* By Captain R. F. BURTON, H.M. Consul at Trieste. [With Plates xii. and xiii. and woodcuts.]

#### INTRODUCTION.

ALLOW me to begin by expressing the great satisfaction with which I find myself once more in this room, and permitted to offer you the results of three years' work. The specimens on the table will show you the nature of that work, and, before proceeding to the papers announced for this evening, I may, perhaps, be allowed briefly to introduce them to you.

The two sketches (Pl. xiii. figs. 1 and 2) represent the only flint implements as yet found in Dalmatia; and I have added the requisite details. They were shown to me by my learned friend, Prof. Glavinic of Spalato. I would propose him and Dr. Lanza di Casalanza as corresponding members of our Society; and I will answer for their value.

The skull and the accompanying bones were found near Bolliunz, a valley about five miles south-east of Trieste. Here the Romans cut an aqueduct in the live rock—a trough which supplied Tergeste with the best water. I have no doubt that some of the caves which now appear natural were hand-worked for mortuary purposes; and, though I will not answer for the skull being Roman, or, indeed, of any great antiquity, I think that it may be a relic of the ancient race, and, as such, I have brought it home for the collection of our learned associate, Dr. J. Barnard Davis.

The collection of pottery and the models of stone implements are intended for the admirable collection of our President, Col. A. Lane Fox. They are gathered from the Castellieri of Istria, concerning which I lately published a paper, with many regrets for the mode in which it was published, and a heartfelt resolution not to do it again. The pottery is submitted to the judgment of experts. To an amateur it appears of different epochs, but I can answer for the fact of its being an authentic find—most of it was dug up in my presence. It occurs in the black earth.



## PART I.—THE LONG WALL OF SALONA.

Salona wants but few words of introduction. She was in turn the *Respublica Salonæ* (inscribed on leaden tube of aqueduct); the *Conventus* and *Colonia* of Pliny (iii. 22), and a host of writers; the Roman metropolis of *Dalmatia Felix*, that fair and fertile section of the land between the *Nestus* or *Tilurus* (mod. *Cettina*) and the *Naro* (*Narenta*) rivers; a *Præfectura* et *Prætura* (*Farlati Illyria Sacra* i. 27), with a *Præpositus thesaurorum*; a *Procurator ginæciorum*; a *Procurator baphiorum* (of the dyeing establishments); and a *Præses Dalmatiæ* (or *Functionarius perfectissimus*). She was the great emporium of the coast, the *ἐμπόριον*, or naval arsenal (*Strabo*, vii. 5); and the "*Totius Dalmatiæ Caput*" (*Const. Porphy. de Admin. Imperii*, cap. xxx.) which, under Augustus, included a part of Western Pannonia. Virgil (*Genethliacum*, *Ecl.* iv.) sang the birth of a "*Saloninus*," and the glories of the paternal triumph: Horace (ii. 1) immortalised the honours of Dalmatic or Delmatic victory. Here "*Duke Bato*" (A.D. 6, *Dion Cassius*, lib. lx., and *Vell. Paterculus*, lib. ii.) fought for liberty against the predatory and oppressive masters of the world; here *S. Domnius* (*S. Doimo* or *Dojmo*) was sent, according to old tradition, by Saint Peter; and here Titus, by order of Saint Paul (*Tim.* ii. 4–10) preached the gospel to Dalmatia. The remains of what an English novelist called the "small but prosperous town of Salona" (?), though seldom visited, are, according to Prof. Steinbüchel, some of the most interesting of classical ruins. Finally, a highly advantageous position has made Spalato, its modern *locum tenens*, the natural, whilst Zara is the artificial and political capital, and the most flourishing, indeed the only progressive port of the old "*Regno di Dalmazia*," which still forms the southernmost province of the extended Austrian empire.

But my business at present is with a single section of Salona, the "*Long Wall*," of doubtful and debated origin.

The celebrated Abate Alberto Fortis (*Viaggio in Dalmazia*, *&c.* 2 vols., *Alvise Milocco*, Venice, 1774, translated into English (London, J. Robson, 1777), and French, "*Voyage en Dalmatie*, Berne, chez la Société Typographique, 1778"),\* who travelled in A.D. 1770–1772, and whose meritorious labours have been a mine copiously quarried by later writers, has no notice of the "*Murazzo*," or long wall, although he gives a detailed description of the ruins of Salona, in his vol. ii. p. 42 (French translation, ii. sec. iii. p. 56).

\* I shall give in these pages references to text and French translation for facility of reference. The book has become somewhat rare and costly.

On the other hand, the late Mr. Paton, so well known as a traveller, and a writer of travels, and mentioned with respect by the late Abate Carrara, visited Salona in 1846-7, and describes this most interesting feature in the following remarks (vol. i. 363, "Highlands and Islands of the Adriatic," by A. A. Paton, 2 vols. London: Chapman and Hall, 1849):

"To the westward of Salona is a remnant of an immense construction, the origin and destination of which is quite unknown to the local antiquaries—a *Cyclopean wall*,\* of regular quadrilateral stones, each from 8 to 16 feet in length. At first sight, I imagined that it must have been the foundation of a temple; but, as it extends 580 paces in length, I soon saw the fallacy of that opinion."

The generic term, "*Cyclopean*," is given to the blocks 6 to 12 feet long by 2 to 5 high, at Tiryns, in Argolis, by Pausanias (*Κυκλώπων . . . ἔργον* ii. 25-7); but he also applies it to the hewn polygons of Mykenæ, and even to the squared masonry of the Gate of the Lions. Euripides repeatedly adapts the same expression to the walls of Mykenæ and of Argos. Lactantius (vid. Stat. Theb. i. 252) explains it thus: "*Arces Cyclopum autem, aut quas Cyclopes fecerunt, aut magni ac miri operis; nam quicquid magnitudine suâ nobile est, Cyclopum manu dicitur fabricatum.*" Of course the picturesque term was seized upon by the imitative Roman poets: Seneca, to mention no other, says:

Quid moror? Majus mihi,  
Bellum Mycenis restat, ut Cyclopea  
Eversa manibus saxa nostris concidant.  
(Herc. Fur. iv. 996.)

The first step would be to smooth the joints, as in the artistic walls of Cosa, and the outer surface, as at Rusellæ, after which the whole stone would be hewn first to the pseudo-isodom, and, lastly, to the isodomie form. Petit-Radel and Dennis (ii. 284) hold the polygonal structures to be Pelasgic, and the former declares (Mem. Inst. iii. pp. 55-66) that they have been found as far south as Lucania and Apulia. Mr. Hamilton ("*Archæologia*") complicates the use of the word by applying it to four several forms of masonry, noting as many different epochs. In the first, the gigantic, irregular blocks are of various sizes, with smaller interstitial stones, but wholly without mortar (Tiryns and a portion of the Maltese "*Torri de' Giganti*," unhewn masses of coralline). The second shows masonry without courses, irregular polygons whose sides fit closely (Mykenæ, Etrurian

\* The italics in this passage, and in the quotations from Sir Gardner Wilkinson and the Abate Carrara, are mine.

Norba, Cære, Arpino, Cosa, and Alatri; also Iulis (of Ceos) and Delphi; in the third, the strata are of the same height, but pseudo-isodomic, or unequal in length of stones (Bœotia, Argolis, and the Phocian cities); whilst, fourthly and lastly, the blocks are of different heights, but always rectangular (Attica). "Rectangular Cyclopean" sounds almost like an Irish bull. Perhaps we had better, with Dodwell ("Pelasgic Remains") and Sir William Gell ("Rome"), despite Bunsen (Ann. Inst., Rome, 1834), limit the term "Cyclopean" to masonry composed of irregular polygons of large size, superimposed and fitted together, more or less closely, with interstitial stones, but without mortar or cement. The oldest form would be a massive wall formed by huge blocks of undressed rock simply piled together without much care for jointing, as at Sidon, and in the Castellieri of Istria, especially that of Cunzi (Kunzi). Similar walls are found at Segni, Alatri, and other Etruscan cities, as opposed to those of Latium. In the second, the sides would be smoothed so as to correspond, but the stones would not be laid in true courses; such are the ruins of Tiryns.

The next traveller of note to Salona, the late Sir J. Gardner Wilkinson ("Dalmatia," &c.: London, Murray, 1848), avoids using the terms "Cyclopean" and "Pelasgian,"\* and describes (i. 160-1) the "wall of large stones" in these words:

"From this point" (the southern town-enceinte) "another wall runs off, nearly at a right angle, which appears again by the roadside, about 115 paces to the westward, and, in a still more perfect state thirty paces further on. It is of very large stones, with *bevelled edges*, admirably put together, and of a *style which resembles Greek masonry*. Some of the blocks are 13 feet long and 2 high. I traced it in the same direction to the distance of 573 paces, or about 1,440 feet; and about 200 paces further on, is a line of rock resembling masonry, which may have been used as a continuation of the defences of the city. On the north side of the wall, the sarcophagus of the Albucii family was discovered, and other tombs are met with hereabouts. This wall may have been used to protect the entrance to the river and the port, or may have belonged to the older city, before the Romans came into Dalmatia, when Salona was already a place of importance; and the character of its masonry is the more remarkable, as it seems to point out a connection with the Greeks." The learned author also shows the importance of Salona by quoting Strabo (lib. vii. 5, § 5):

*Ἐπεὶτα . . . καὶ ἡ τῶν Δαλματέων παραλία, καὶ τὸ ἐπινέειον αὐτῶν Σάλων. Ἔστι δὲ τῶν πολλὴν χρόνον πολεμησάντων πρὸς*

\* Dionysius Hal. (i. 28) relates on the authority of Myrsilus that the wall which surrounded the City of Athens was called Pelasgic.

Ρωμαίους τὸ ἔθνος τοῦτο, κατοικίας δ' ἔσχεν ἀξιολόγους εἰς πενήκοντα, ὧν τινὰς καὶ πόλεις Σάλωνά τε καὶ Πριάμονα (Priamon ?), καὶ Νινίαν, καὶ Σινώτιον, τό τε νέον καὶ τὸ παλαιόν, ἃς ἐνέπρησεν ὁ Σεβαστός (Augustus).\*

The highly distinguished Egyptologist, to whose literary kindness I am personally indebted, here showed his normal acumen. But "bevel" means properly rabbeting, or oblique rebatement; in fact, "the angle formed by two surfaces of a solid body, meeting at an angle which is neither a rectangle nor half a right angle." It is still a favourite with architects, but we must not apply the term to the masonry of Salona; the latter is chisel-dressed to a narrow flat draught or border, and a boss or projection, apparently of unusual height, and invariably forming a rectangle with the lower plane. By some writers on the Holy Land (*e.g.* Dr. Barclay, "City of the Great King," p. 494) it is made a characteristic of "Hebrew architecture," whatever that may be; and, probably because they observed it at the "wailing-place" of the Jews, they named it the "Jewish bevel," a compound misnomer, it being neither "Jewish" nor a "bevel." The "Chosen People," I need hardly say, borrowed all their architecture, and, indeed, art in general, from the polished Phœnicians, and even more distant races.

This variety of stone-dressing, so useful in the determination of style and date, appears hardly to have been studied with the attention which it merits. A distinguished English archaeologist at Rome informed me that he held it to be a classical



form originating in the early centuries after our era. How far wrong he was, may be judged from the foregoing sketch of the huge walls, which are generally, indeed universally, supposed

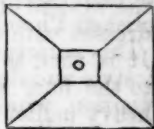
\* "Then . . . the coast of the Dalmatæ, and their naval arsenal, Salon. This nation was for a long time at war with the Romans" (alluding to the Illyrian wars). "They had fifty considerable settlements, some of which were in the same rank of cities as Salon, Priamon, Ninias, and the old and new Sinotium.

to be part of the Agger of Servius Tullius. I was honoured with the illustration and the following note by the discoverer, the Right Rev. Father Joseph Mullooly, the learned Prior of S. Clemente, whose "History of Excavations," and "Saint Clement and his Basilica in Rome" (1 vol. 8vo) are so highly valued:

"The breadth of the draught or border of the tufa stones is a little more than an inch each way, and the cavity or channel between them precisely three centimetres, which gives the height of the boss. The tufa blocks, which I discovered under the floor of the subterranean basilica are believed by Mr. Parker, C.B., to date from the early days of the Roman Monarchy, and the travertine from the Republican times."

The object of the "draught and boss" was evidently to relieve the jointing from the over-pressure of heavy bodies; hence we find the system variously adapted to a multitude of different forms by the latest, as well as by the earliest, builders. Some are exceedingly complicated. For instance, in the palace of King Hensius, at Bologna (Palazzo del Podestà, A.D. 1261-1485), each stone has a central rose upon a flat table, highly raised, and connected with the corners by four ribs, each from one of the sides of the square. (See fig.)

Perhaps the most popular is the bevel with rusticated boss; and I have noticed, both in England and in Syria, the raised draught and the sunken centre, a modification which clearly defeats its own purpose.



The learned Dr. Rosen, formerly Prussian Consul at Jerusalem, finds the following three distinct epochs of megalithic and "bevelled" (i.e. draughted and bossed) architecture in that most venerable part of the East:

1. The fine, rather wide, and shallow draught, often 6 inches in breadth around the edge, the whole stone carefully squared, and the boldly projecting boss finely cut and plain-dressed like the border. This he would call pre-Herodian, though there is no reason to think that the Israelitish cities had any peculiarities of architecture, and he instances the "Wailing Place;" Arák el Amír, in Gilead (B.C. 290), and other well-known ruins.
2. The deeply-draughted edge, with the face of the stone projecting more boldly, and only rough-dressed with the hammer, or left as hewn from the quarry. He would consider this early Roman and Herodian, and he finds it in most of the ante-crusading remains.
3. The latest type is the roughly-draughted border, with the

Augustus burnt them down." In Strabo, the Dalmatian coast, the coast of the Iapodes (Fiume), Liburnia (Northern Dalmatia), and the Liburnian Islands, especially the modern Liessa and Lesina, are given in due order.



whole face of the stone standing boldly out, but only hammer-dressed, or left as first quarried. This, he says, denotes the later Roman period.

The Rev. Mr. Tristram, a careless and superficial observer, speaks (p. 78, "The Land of Israel," London, 1866) of the "well-known *Jewish or Phœnician bevel*," and attributes (p. 80) to Dr. Rosen's first and earliest epoch the Haram of Hebron, which we have every reason to think is of far later date.

I would distribute the draughting and bossing (not bevelling) of the Syrian ruins into three epochs—the Phœnician,\* the classic (Greek or Roman), and the modern, the latter being conspicuous in the khans or caravanserais. There are many local varieties; for instance, the double form in the church of Constantine and Helena at Yabrúd. Syrians, ancient and modern, work everything, from sewing to stone-dressing, in ways differing from, and often contrary to, Europeans. For instance, they begin to dress, not with the hammer, but with the pick, which with us comes much later.

The modern style of cutting stone in Dalmatia and Istria, which probably dates from the remotest days, may throw light upon the system of their classical predecessors. The ashlar is first dressed with the heavy square-headed *mazza* or metal hammer. It is then subjected to the *punta*, pointed, or narrow chisel, or to the finer *scalpello*, both used with the *mazziola*, or *maglio*, a heavy mallet of soft iron, in which the hollow can be filled up. The modern pavement of Trieste and other towns employs the *punta* when the sandstone blocks are laid in place. The next process is the application of the *brocca*, a triangular pick, with sharp apex and a toothed base. Then comes the *martello di denti grossi, medii* (vulgo, "*il bastardo*") *e fini*, the latter called *doppia martellina*, because the teeth are double in number; for instance, one head will have sixteen, and the opposite eight. The French *boucharde* with diamond-shaped steel points, worked with the *masse*, and the Italian *bocciarda*, useful in treating granite and hard stones, is common at Vienna, but not used at Trieste or in Dalmatia. Finally, the stone, finished with the finer *scalpello* of many forms, even dentated, is polished with common sand or *saldame* (Molla or Sasso Marzo), a fine powder of silix found in the limestone strata, and not easily accounted for.†

\* From the Phœnicians came the Etruscan boss, which is found at the ruins of Misano, near Bologna, to mention no other place.

† These pockets, full of fine silix, are mysterious formations, to which Linnæus (Syst. Nat. "Silix") alludes, "*Silix nascitur in montium cretaceorum rimis, uti quartzum in rimis saxorum.*" We find them at Proseco and Reppen Tabor, near Trieste, where the colour is dark, and near Pola, whose ruddy or straw-tinted sand has been extensively used for Venetian glass. The same anomaly occurs in volcanic Iceland, whose silix beds near Cape Reykjanes (the south-western ex-



If a *spigolo* (list), or a *listello* (draught), be required, it is worked with the *martello* rather than the *scalpello*, and the *rustica* is left simply random-tooled or hammer-dressed, not grooved nor pitted into holes (prison rustic). La Bugna (*pietre bugnate*) is the term applied indifferently to "frosted stones," to the bevel, or to the boss and draught.

Amongst Dalmatian writers, the only authority who has treated the "Murazzo" of Salona as it deserves is the well-known Abate Carrara ("Topografia e Scavi di Salona," del Dr. Francesco Carrara, Trieste, 1850). In the first (topographical) part of his learned little volume, he mentions it only once (p. 63); in the second portion, or history of the excavations, he refers to it three times. The first (p. 128) is in connection with the classical cemetery enclosed by it, and by a wall of large white (limestone) blocks, carefully squared, running parallel with it to the north, and distant 3 Viennese tese (fathoms—each 6 Austrian feet=6 feet 2 inches '67). In p. 147, he tells us that between 1847-8 were opened "ottocento klafter (the same fathom) di muro ciclopico di epoca antiromana;" and in pp. 136-9 he describes it in these words:—

"All'ovest della città antica si mostravano gli avanzi di un muro a grossi massi squadrati della quarta epoca delle costruzioni ciclopiche (courses of various sizes, but always rectangular). Il quale continuava interrottamente per quasi 130 tese, senza mostrare nè cominciamento nè fine. Tra per la curiosità di determinare l'estesa e la direzione di quel muro, non meno che la sua relazione col perimetro dell' antica città, e con ciò soddisfare ad un importante curiosità nostra, ed al desiderio del dotto viaggiatore Scozzese, A. A. Paton ('Allgemeine Zeitung,' Adriatische Briefe vii. Salona, num. 141, 1846); e tra pel desiderio di cercare la lunghezza della necropoli scoperta a fianco della via maggiore, condussi a termine, mediante tasteggiamenti, uno scavo importante. Dal quale rilevo che il muro ciclopico segnato nel mio piano a linea grossa interrotta, lungo più di 800 tese, partendo dalla cinta a ponente del perimetro antico, torre, pressochè in linea parallela alla strada regia, attraversando il torrente Slano, e continuando sino a quello di Blandiste, che marca il confine tra Salona e Castel Suguraz. Di là, anzichè avanzare al disopra della strada, risalta al Sud, riescendo con dolce deviazione dalla prima linea fino alla località detta Stačun ove termina con due mausolei.

La misura media de' massi che formano il muro ciclopico dà in altezza 2' 3" (Viennese feet 100=103.71 English),

tremity), a purely eruptive country, have been spasmodically worked. Pliny (xxvi. 6) declares that the Roman workmen used a sand found in the bed of the Adriatic when the waters retired. Fortis (ii. 271) noticed this Saldame at Loparo (Neo-paros?) in the Island of Arbe.

in larghezza 2' 6"; in lunghezza 10'; il muro non è più grosso della grossezza dei massi.

"Codesto muro ciclopico fiancheggia la strada antica romana sopra la quale i francesi, per ordine de Marmont, aprirono nel 1808 la strada regia attuale. La deviazione che ho notata di esso muro della strada regia al torrente Blandiste, si spiega con ciò, che i francesi, arrivati a quel punto, piuttosto che progredire sulla linea della via antica, rificero la direzione della strada per farla più mediterranea lungo la bellissima riviera delle Castella. Ciò nulladimeno, dalle osservazioni fatte in tanti anni a Salona, vedo costantemente che ogni strada e viuzza attuale corre sopra le rovine di una via o di un clivo romano.

"Dal muro ciclopico preesistente a Salona romana, trassero partito i Signori del mondo per istabilirlo a linea di divisione fra la via pubblica e la maggiore necropoli. E difatti, dal punto in cui il muro si stacca dal recinto di Salona, sino a che si perde nel torrente Blandiste, al nord di esso, trovasi il cimitero antico, al sud la strada; da Blandiste a Stagun la necropoli si presenta al sud, la strada al nord. Il quale mutamento di disposizione risultante da moltissimi tasteggiamenti da me fatti (a tutto giugno dal recinto all' ovest di Salona sino ai mausolei che seguano il termine scoperto del muro ciclopico si mostravano più di 300 buchi non minori in superficie di una tesa quadrata, profondi dai 4 a 12 piedi), si spiega di leggieri dal contraste che offrono le due linee di muro toccanti al torrente Blandiste. Del resto per determinare l'uffizio di quel muro converrebbe continuare l'opera incominciata nel quarantotto, e per lo meno con ispessi tasteggiamenti cercarne l'ulteriore andamento. S'arriverebbe forse a conoscerla, come è verosimile, quale muro di precinzione di Salona antiromana, che è quanto dire dell' antica Salona."

In p. 139 we read, "Ora nel discoprimiento de più che 800° (fathoms) del muro ciclopico, hassi un mezzo di comprendere la causa del fallo, e scusare taluno di que' grossissimi errori" (alluding to the discrepancies of shape and measurements found in former descriptions of Salona). Page 157 notes that the Roman theatre has a "muratura a bugnato," which, I have said, applies equally to the bevel and to the draught and boss, the latter being here meant; but no notice is taken of the same work in the Cyclopean wall, which is far more remarkable and characteristic. Moreover, when stating that the "Murazzo" shows neither beginning nor end, the learned Abate had not noticed the highly interesting eastern prolongation which extends nearly to the new town.

The accompanying plan of Salona (Pl. xii.) shows by numerals the position of the pre-Roman wall. It begins (H) at the junction of the two enceintes, the "linea di congiungimento de' due perí-

metri Romano-Salonitani" (Carrara), and near where the learned Abbé places his "Porta Suburbia." The stones, at once distinguished by their size and by their blue-grey tint, the *argilla marina plumbata* of old authors, are much degraded. Thence it runs from magnetic SSE. to NNW., roughly speaking: beyond the amphitheatre forming the north-western angle, it has been totally destroyed; but farther along the path, the line bends at nearly a right angle to the south-west, till it abuts upon the modern Strada Postale, or Regia of Spalato-Traù.\* Here also the soft material has been seriously injured by time and weather. Beyond this point it resumes nearly its original direction (SSE.--NNW.), and, passing the place marked in the plan "Scavi di, 1824," Orto di Metrodoro, it is in tolerable preservation. At the angle where the Strada Postale bends suddenly almost to north, a natural reef-ridge of large limestone blocks, standing up like a wall, prolongs the "Murazzo," with a slight deflection, to the sea-shore. I saw no traces of work on this feature, and, although draughted and bossed stones are said to have been found along the eastern side of the French highway, I could not detect them.

The accompanying rough sketch from my diary shows the position and the dimensions of the three courses of masonry where the wall is best preserved. I was assisted in the work by M. Aristide Vigneau, of Spalato, and I have been promised a photograph of this highly interesting section.

Height of highest tier	. 0.61 metres	} 2 ft. English.
Height of middle tier	. 0.61 metres	
Height of lowest tier	. 0.18 metres	
		7 inches "

The latter buried in gutter of roadside.

Mostly blackberry bushes.



"Murazzo" (Long Wall) of Salona, facing SSW.

The lowest stratum is almost concealed by the north-eastern side-drain of the Strada Postale. The reverse flank is completely buried, and the bushes projecting over the top spring

\* The well known *Tragurium* of the Romans, which Const. Porphyrogenitus (De Administr. "Imperi," cap. xxxvi.) writes *Tetrurium*; we find "*Cum tota Travia*" in a document dating from A.D. 1400 (Boglic, p. 91); the modern form is *Troghir* (Slav) and *Traù* (Ital.), which Wilkinson writes, without reason, *Traù*.

from a cornfield. The sooner excavations are here made the better.

This "Murazzo," to use the Venetian term, cannot be considered a sea-wall, nor is it the defence of the more modern Roman city—the two favourite conjectures. The shore line is wavy, and its distance from the masonry ranges between a minimum of 50 and a maximum of 220 metres. The Strada Regia follows very nearly the ancient line, as the discovery of a milliary column proved, and the following facts show that it was like the Via Appia and the Roman entrance to Palmyra,\* a favourite site for cremation and interment, ash urns being found on one side and tombs on the other. North of the wall is the well-known Roman necropolis, where a number of sarcophagi, based either upon stone pavements or upon the naked earth, are still seen. They had been rifled and injured, probably about the time of the Hijrah, by the Avaro-Slav invader (circa A.D. 639), before his expulsion by the Croat. On the other side again (south), at the place marked "Scavi, 1824, Dolj Sepulerali," a curious amphora-shaped dolium, with narrow neck, was found horizontally cut for the admission of a human body. It is figured by Dr. Lanza ("Monumenti Salonitani inediti"), but I could not procure a copy, the book having long been out of print. Here many sepulchral urns with ashes, and mostly inviolate, unlike the more exposed sarcophagi, have been unburied. We may, therefore, conclude that this part was the Ustrinum, Ustrina† or burning-ground, the Smáshan of the modern Hindus.

It is not a little curious that no less than nine jars containing bodies have been found when excavating the cities and cemeteries of Etruria Circumpadana, near Bologna. The Bolognese amphoræ which contained the remains were either full length—that is, pointed at the base—or half-sized, with flat bottoms, and in all cases the skull was found upwards or near the mouth. The reverse was the system of the Brazilian Tupi-Guaranis, and I have suggested ("Notes to Hans Stade," i. 125) that the idea arose from their desire of returning the body to the position in which it was originally formed. In all cases which came under my notice the head was placed downwards, as if in the womb,

\* From Palmyra we may judge that the practice, at once hygienic and æsthetic, passed over to Etruria, from which it was borrowed by the Romans. The Etruscan cosmogony, which puzzled antiquaries by its curious resemblance with that of Genesis, has, at length, been explained by the discoveries of Mr. George Smith at Koyunjik. The Chaldean story of the Creation and Fall of Man proves that the Genesis mythus attributed to Moses extended throughout the nearer East from Egypt to Assyria, and hence it was evidently transported by the Etruscans to Italy.

† The Ustrinum differs from the *τύμβος* or Bustum; in the former the corpse was burnt; in the latter it was also buried.

although M. Adolfo de Varnhagen ("Historia Geral do Brazil," Pl. opp. p. 112) gives an illustration with the feet downwards.

That the "Murazzo" is not Roman is proved by its remarkable contrast with the more modern epoch. The material is everywhere a calcareous eocene marl, a transition from limestone to sandstone, blue-grey, and easily degraded, the *marne* of the Mons Caprarius, which forms the lofty background of Salona. All the Roman city is built of the calcaire (nummulitic,\* hippuritic, &c.) of the same period, quarried from the backbone of Dalmatia, the eastern fork of the Apennines. This, in fact, is the normal rock bounding the Mediterranean sea-board. The material of Diocletian's palace was quarried in the island of Brazza, once doubtless terra firma, and the port at which it was embarked is still known to the people as Spliska, Spljet being the Slav equivalent for Spalato or Aspalathus.† Again, the length of the sandstone blocks which we measured, varies from a minimum of 0.90 (2 feet 11 inches) to a maximum of 2.76 metres (8 feet 2 inches); the depth of the highest and middle courses is 0.61 (2 feet), and the third shows only 0.18 (7 inches). The width of the draught ranges between 6 and 16 centimetres (2.40 inches to 6.40 inches), and the bold boss may have originally risen as high as 8 inches. In the Roman theatre (P) the stones are also draughted and bossed, but the largest gave a length of 1.11 metres (3 feet 7 inches), with a draught varying in width from 31 to 87 millimetres (1 inch to 4 inches the maximum), and the projection of the boss was insignificant. The same stone-dressing will be found in the Temple of Esculapius at Spalato—a name traditionally given without a shadow of reason, and in the "Duomo" (*domus* or cathedral) of S. Doime, attributed to Jupiter, apparently because Diocletian assumed the title of Jovius; or to Diana, because the frieze shows hunting and other rural subjects; but in both cases the draught is narrow, little exceeding an inch.

Two distinct origins have been proposed by local antiquaries for this interesting feature, and both agree, with Wilkinson, in attributing it to the Greeks.

P. Farlati (Illyr. Sacr., i. 272) and Carrara (*loc. cit.*) find it

\* These nummulites mark the *début* of the Tertiary epoch, and the hippurites are so common in Istria that they have been called the Istrian formation.

† Const. Porphyro. gives Aspalathos (chap. xxxvi.) amongst the coast cities held by the Dalmato-Romans. In the fifth century (temp. Arcadius Notit. dignitat. utriusque Imperii. caps. ix. x., quoted by Lanza, p. 23, Dell' Antico Palazzo, &c.), we read of the "Procurator Gynæcii Jovensis Dalmatie Aspalato." According to Lanza, the "urbicola," rebuilt after the Avar invasion of the seventh century, was first called Aspalathum, then Spalatum, and lastly Spalato, not Spalatro, as the learned Fortis has it. Mr. G. P. R. James, the novelist, speaks of the "little village of Aspalathus" in the days of Attila; he also terms Salona a "small but prosperous town"—the "but" is charming.



in Apollonius Rhodius (B.C. 250). That poet (iv. 336—563 *et seq.*) makes, in his "Argonautica," the Colchi, led by Absyrtus, who accompanied, or who was sent by, his father Æetes, in pursuit of his sister Medea, occupy the island in which he was slain. This is generally supposed to be Osero, or Ossero, near Cherso (Kherso)\* in the Sinus Flanaticus (hod. Quarnero, or Gulf of Fiume, and its section between Cherso and Arbe the Quarnerolo). The earlier name was "Ἀψωρος," Ἀψωρος, or Ἀψορρός; and the neighbouring "Ἀψυρτεῖς," Ausyrtides, or Absyrtides (cf. Strabo vii. 5, vol. i. p. 484, Bohn) as far as the Nestus (Tilurus) river of Cettina,† not to be confounded with the Nestus of Epirus (hod. Mesta or Kara-sú), a coast wholly wanting islands. After occupying "*usque ad Salangonem* (Salona?) *fluvium, Mestidaque terram*" (Carrara), they moved off to Issa (Lissa) to Kerkyra Nigra (Κέρκυρα μέλαινα, mod. Curzola) and Melite (Meleda). In lib. 4, l. 524 (Merkel's Edit. Leipzig, 1854) we find mention of 'Τλληῖς, and in line 535—

"Ἀμφι πόλιν Ἀγανὴν Ὑλληίδα

"where some read Ἀγανὴν, and others, μεγάλην," the greatest of the fifteen cities of Scymnus Chius (407), and possibly hence the corruption Salangon, twice referred to by Carrara (pp. 1-4). In lines 562-3 we have

'Ἄλλ' ἔθειον γαίης Ὑλληίδος ἐξανιόντες  
Τηλόθει

And this Hylleis is supposed to have been colonised by Hyllus, son of Hercules (B.C. 1230), father of the Ὑλλεῖς or Ὑλλεῖοι

The learned Abbé adds that if the Siculo-Issani (of modern Lissa) built, as we know they did, Epetium (mod. Stobrez) and Tragurium, afterwards the "*oppidum Romanorum marmore notum*" (hod. Traù), they would hardly have neglected the admirable position of Salona, which lies between the two, and

\* The Abbé Fortis, "Saggio d'Osservazione sopra l'Isole di Cherso ed Osero," Venice, 1771 (pp. 1-12), treats this subject with abundant erudition. I fail to see the reason why a barque, manned by about 50 men, should not have coasted along the Black Sea, have ascended the Danube, and even have been portaged to the Istrian coast. Yet the "Myth of the Argonauts" is a favourite thesis for German nebulosity, and the last treatment was administered by Dr. A. Kuhn ("Über Entwickelungstufen der Mythenbildung," Berlin, 1874).

† "Nastus (alii Nastos) urbs et fluvius Illyrii hinc Nestius," says Steph. Byzant, quoted by Giovanni Lovrich, "Osservazioni sopra diversi pezzi del Viaggio in Dalmazia del Sig. Ab. Alberto Fortis," &c., Venezia, 1776. He is a severe critic who chooses for his motto, "His quæ narrata sunt non debemus cito credere; multi ementiantur ut decipeant, multi quia decepti sunt" (Sen. de ira); and "Credat Judæus Apella" is a favourite exclamation. The learned Abate's book was so famous that it could not fail to find its Zoilus.



which is far superior to both. Moreover, he assures us that Illina is the name still locally given to the ground lying west of the oldest Salonitan gateway, the Porta Cesarea; and that Illino-vrilo (Hyllus-fount) is the peasants' name for the spring between the chapels of SS. Cajo and Doimo at the foot of Mons Caprarius.

On the other hand, the Herakleia of Scylax Caryandensis is proposed by other antiquaries, especially by Professor Francesco Dr. Lanza di Casalanza,\* a highly distinguished geologist,

\* The following is a detailed list of Professor Lanza's meritorious works:—

1. "In Cyanuretum rubium, inquisitiones chemico-pharmacologicae." Ticini Regii, 1831. Vol. i. in 8vo.
2. "Sopra le Terme dell' antica Salona." (V. *Bullettino dell' Istituto di corrispondenza archeologica*. Roma, 1837, pag. 131).
3. "Relazione nosografica statistica sull' epidemia colerosa che invase la Dalmazia nell' anno 1836, corredata di osservazioni pratiche specialie generali, aggiuntavi la descrizione dell' Aretermo inventato dall' Autore, per la immediata applicazione del calore all' esterno." Trieste, 1838, un opuscolo in 8vo, con una tavola.
4. "Saggio storico-statistico medico sopra l'antica Narona e lo stato presente del suo territorio, corredata di una carta topografica." Bologna, 1842, vol. i. in 8vo.
5. "Doveroso tributo di un figlio." Torino, 1846, un op. in 8vo.
6. "Dell' Mausoleo dell' Imperatore Diocleziano in Spalato: Lettera all' illustre Sig. Cav. Geo. Dr. Labus, Spalato, 1 Agosto, 1846. (V. *Giorn. La Dalmazia*, 1846, n. 52).
7. "Ancora pochi cenni sul Mausoleo di Diocleziano." (V. *Giornale, La Dalmazia*, 1847, n. 14).
8. "Confutazione alla illustrazione del supposto sepolcro di Diocleziano e vera interpretazione dei bassirilievi che vi si trovano scolpiti." (V. *La Dalmazia*, 1847, n. 48-49).
9. "Le Bocche di Cattaro, descritte ed accompagnate da vari costumi." (V. "il Mondo illustrato," di Torino, ed il *Giorn.*, *La Dalmazia*, del 1847.)
10. "Il Montenero." (V. *Enciclopedia popolare di Torino*.)
11. "Dell' Isola Lesina." (V. *Encic. pop. di Torino*.)
12. "Dell' Isola Lessa." (V. *Encic. pop. di Torino*.)
13. "Narenta." (V. *Encic. pop. di Torino*.)
14. "Dello stato economico di Castilnuovo nel Circolo di Cattaro." (V. *Giorn.*, *La Dalmazia*, 1847.)
15. "Sugli attuali bisogni della Dalmazia: Lettera ad un amico." (V. *La Dalmazia costituzionale*, 1848, li. 16.)
16. "Delle condizioni presenti dell' Austria: paroli di un dalmato." (Art. pub. nel *Giornale La Dalmazia costituzionale* e reprodotta nel *Giorn. del Lloyd Austriaco*, del 1848, n. 173).
17. "Delle cognizioni di chimica indispensabili alla scienza agraria." (V. *Gazzetta di Zara*, 1848, n. 11, 12.)
18. "Metodo efficacissimo per la guarigione di ferite d'arma da fuoco agli arti complicati a fratture delle ossa per cui può risparmiarsene l'amputazione." (Art. pub. dall' *Ecc. Governo del Litorale Aust.* in Giugno, 1848, e diramato al personale sanitario dell' armata Austriaca.)
19. "Antiche lapidi salonitane inedite illustrate." (Spalato, 1848, e 2da ediz. Zara, 1850, un vol. in 8vo.)
20. "Sulla importanza della storia naturale e della economica rurale: Discorso inaugurale, Zara, 1849, un op. in 8vo.
21. "Della Topografia dell' antica Salona, con una carta topografica." (V. *Annali dell' Istituto di corrisp. Archeol.*, Roma, 1849.)
22. "Rapporto generale degli Scavi di Salona, dalla loro prima istituzione sino al giorno d'oggi." (V. *Annali dell' Instit. di corrisp. Archeol.*, Roma, 1850.)

numismatist, and antiquary, who has travelled in England, and who has written his travels. He kindly gave me a copy of his useful study "Dell' antico Palazzo di Diocleziano in Spalato," &c., &c. (Trieste Tip. del Lloyd Austriaco, 1855), in which he has made sundry corrections of Adams' the architect's classical folio, "The Palace of Diocletian," and of his "Antiche lapidi Salonitane inedite illustrate." In this volume the inscriptions are translated, not merely copied, after the lazy fashion of many authors, and the learned writer has freely acknowledged the assistance of the celebrated Abate and Professor Furlanetto, and of his distinguished father, the late Carlo Lanza, a surgeon in the French army of occupation. I can only express a hope that his manuscript, "Discorsi critici sulle antiche Storie degli Illirici, dei Dalmati e dei Liburni," may soon see the light; and that the learned author will republish, for the benefit of travellers, his valuable essay, entitled "Monumenti Salonitani inediti," printed in its Transactions by the I. R. Academy of Sciences, Vienna, and in a separate form, also at Vienna, 1856.

We find the only notice of Illyrian Herakleia in the Periplus attributed to Scylax Caryandensis, and written—such is the difference of commentators—between the middle of the fourth century B.C. and the third and fourth centuries A.D. (Müller). P. Farlati has charged the Greek author with inac-

23. "Poche parole ancora sul colera, e specialmente degli insetti che furono osservati generarsi nei cadaveri dei colerosi." (D. Gazzetta di Zara, 1849, n. 124.)

24. "Sulle opinioni riguardo alla contagiosità del colera: Lettera al Sig. Redattore dell'Osservatore Dalmato." (V. Osservat. Dalmato, 1849, n. 131.)

25. "Sulla Topografia e scavi di Salona dell' Ab. F. Carrara Confutazione." Trieste, 1850, un opus. in 8vo.

26. "L'Agronomo raccoglitore; Giornale ebdomadario di economico rurale." Zara, 1850.

27. "Elementi di Mineralogia basati sui nuovi principi di cristallografia e di chimica, ad accerupagnati da pratiche applicazioni economiche industriali con molte figure intercalate nel testo." Trieste, 1852, un vol. in 8vo.

28. "Di alcune ricerche geognostiche sulle formazioni dei dintorni di Zara." (V. Programmi dell' I. R. Ginnasio Superiore di Stato in Zara, 1851-1852.)

29. "Nuove ricerche sulla formazione geognostica della Dalmazia: Rapporto rassegnato all' I. R. Direzione dell' Istituto Geologico dell' impero in Vienna." (V. Il Collettore dell' Adige Verona, 1853, n. 4.)

30. "Elementi di Zoologia ad uso degli I. R. Ginnasij e delle scuole Reali Austro-Italiane," 2nd ediz. Vienna appresso Gerold, 1855, un vol. in 8vo, con molte figure intercalate nel testo.

31. "Dell' antico palazzo di Diocleziano in Spalato." Illustrazione con 12 Tav. orig. Trieste, 1855, un vol. in 4to.

32. "Monumenti Salonitani, inediti illustrati," con 10 tavole originali. Vienna (per cura ed a spese, dell' I. R. Accademia delle Scienze.)

33. "Sur les formations géognostiques de la Dalmatie: memoria pubblicata nel Bulletin de la Société Géologique de France, nel f. di Dicembre, 1855, con una tavola litografata."

(For publication.)

34. "Discorsi critici sulle antiche storie degli Illirici, dei Dalmati e dei Liburni," un vol. in 8vo.

curacy concerning the Narenta, but he is fully rehabilitated, on this point at least, by the Abbé Fortis (ii. 152, Fr. ii. 208). As the passage of Scylax, though evidently corrupted, and in places, with its "lacunæ et interpolationes," almost unintelligible, is of the highest importance, it will be advisable to quote it at full length (cap. xxii. p. 28, "Geog. Græci min." C. Müller, Paris, 1860).

ΙΛΛΥΡΙΟΙ. Μετὰ δὲ Λιβυρνοῦς εἰσιν Ἰλλυριοὶ ἔθνος, καὶ παροικοῦσιν οἱ Ἰλλυριοὶ παρὰ θάλατταν μέχρι Χαονίας τῆς κατὰ Κέρκυραν τὴν Ἀλκινόου νῆσον. Καὶ πόλις ἐστὶν Ἑλληνὶς ἐνταῦθα, ἣ ὄνομα Ἡράκλεια, καὶ λιμὴν. Εἰσὶ δὲ καὶ οἱ λατοφάγοι καλούμενοι Βάρβαροι οἳ δὲ Ἱεραστάμναι, Βουλينوὶ (Ἰλλινοὶ ?)· Βουλινῶν ὁμοτέρμονες Ἵλλοι. Οὗτοι δὲ φασιν Ἵλλον τὸν Ἡρακλέους αὐτοὺς κατοικίσαι· εἰσὶ δὲ Βάρβαροι. Κατοικοῦσι δὲ Χερρόνησον ὀλίγω ἐλάσσῳ τῆς Πελοποννήσου. Ἀπὸ δὲ Χερρόνησου παραστόνιον ὄρθον [*var. lect.* Ἀπὸ δὲ Χερρονήσου (Σίτσα νήσος) παρα (τείνει) ὡς ταινίον ὄρθον ?] τάντην παροικοῦσι Βουλिनοὶ. Βουλिनὸς δ' εἰσὶν ἔθνος Ἰλλυρικόν. Παράπλους δ' ἐστὶ τῆς Βουλινῶν χώρας ἡμέρας μακρὰς ἐπὶ Νέστον ποταμόν.

Müller offers the following Latinisation:—

"22. ILLYRII. Post Liburnos sequitur Illyriorum gens, habitant que Illyrii secundum mare usque ad Chaoniam, que est ex adverso Corcyræ, Alconoi insulæ. Est que ibi urbs Græca, cui nomen Heraclea, cum portu. Sunt ibi etiam lotophagi qui vocantur Barbari hi: Hierostamnæ, Bulini (Hyllini ?); Bulinorum vicini Hylli. Hi Hyllum Herculis filium sedes ipsis assignasse ferunt; sunt autem barbari, incolentes peninsulam paullo minorem Peloponneso. Post peninsulam vero (insula ?) oræ præ-tenditur quasi tænia recta; juxta quam accolunt Bulini [Holstenius "Post Chersonesum litus directum accolunt Bulini?"]. Bulini autem sunt gens Illyriorum. Præternavigatio regionis Bulinorum usque ad flumen Nestum est longi diei unius."

Of Corcyra (Κέρκυρα μέλαινα) we have no doubt. As regards Herakleia, the theory of Müller is that the city's name found its way into the text as a mere gloss to the words Ἵλλον τὸν Ἡρακλέους αὐτοὺς κατοικίσαι. It has long been suggested, and with much probability, that the Ἱεροστάμναι is a corruption of Ἰαδερατῆναι, the people dwelling upon the river of Salona, so well known by Lucan's oft-quoted couplet (iv. 404):—

Qua maris Adriaci longas ferit unda Salonas  
Et tepidum in molles Zephyros excurrit Iader.

The name of the streamlet is also written Hyader, Jader, and Ider, the latter in the fifth century by Vibius Sequester (glossary): Pliny and the Anonymus Ravennæ prefer Salon; and the Acts of S. Domnius Salonus; whilst Carrara (p. 1) believes it to

have derived its name from the city. Similarly, according to Lovrich ("Osservazioni," p. 11) the Rumin, Buda, and Grab streams, took their names from the villages through which they flowed. This writer would make Nastos, or Nastus, an Illyrian word, Na-sto (above a hundred), corresponding with Cettina, alias Zentina or Zentena, because it was the chief of a *hundred* castles or cities.

Of the words *Βουλινοί* and *Ἰλλυνοί*, Müller remarks, apparently without sufficient reason, "ejice vocem natam ex ditto-graphia nominis precedentis." The Bulini are the *Βουλιμεῖς* of Dionysius Periegetes (387), who makes them contermini of the Hyllic Region, and Eustathius explains that these "*Βουλιμεῖς*" are also called *Βουλινεῖς* or *Βουλινούς*. In the anonymous poet vulgarly called Scymnus Chius (B.C. 92, if he be so old?), we find, 404—

*Τούτοις* (Pelagones et Liburni) *συνάπτον δ' ἐστὶ Βουλινῶν ἔθνος.*

The learned historian Lucius (Giovanni Lucio), of Traù, would place the Bulini about the present village of Bossiglina, commonly pronounced Bussiglina, an old fief of the Bishops of Traù, famous for fleeces. It is mentioned by Fortis as a pauper settlement, where the people cooked and ate arum, asphodel, and juniper berries.\*

We now approach the most debated part of the passage. Scymnus Chius (405) mentions the *Μεγάλη Χερρόνησος Ἰλλική*, believed equal (in extent) to the Peloponnesus, and containing fifteen cities inhabited by the Hyllæi. These people are described as *Κελτικὸν ἔθνος* (Etym. M. pp. 776, 39) and as Pelasgi by Niebuhr (R. G. i. 53). Pliny also (iii. 26) gives the Peninsula "*Hyllis*" a circumference of c. m. paces.

Lucius of Traù, would confine the great Hyllic Peninsula to the lozenge-shaped, rocky-tongue of land projecting from Mossor, and bounded north by the Iader, and south by the Xarnovizza (the stream of the Xarn or mill), the latter unknown to the classics. This spear-head divides the little bay of Spalato from the long gulf of Salona, and its bold apex is the Promontorium Diomedis, perhaps the later Fanum Dianæ, a western projection of Monte Mariano, not "*Marglian*," so given by Wilkinson (i. 113). As Fortis very justly remarks (ii. 4, Fr. ii. 5 and 6) the Greek author must not be credited with the blunder of comparing with the Morea a slip of land, a triangle

\* The shrub grows wild all over the limestone formations of Istria and Dalmatia. In the remoter parts, a wine is made from the fermented berries, and the fresh fruit is used in medicine. A favourite prescription against rickets in children is to pound to a paste in a stone mortar the freshly-gathered berries, to mix with an equal part of fresh butter, and to apply this pomade to the articulations and the parts affected, every night and morning before the child rises.

only 12 miles long by 5 of maximum depth, between the Islet of Rogosnizza and the Bossiglina village. The learned Abbé would, therefore, identify the Hyllic Chersonesus with the rich riverine peninsula from the mouth of the Titius of Pliny (iii. 24), the Titus of Ptolemy (*Τίτου ποταμοῦ ἐκβολαί*, ii. 17, § 3), now the Kerka of Sibenico, and the Tilurus, the modern Cettina or River of Almissa. . This tract contains the "belle campagne" of Kniv, of Petrovopolje, and of Cettina or Sign, and the site of Promona, the chief Illyrian settlement in the days of Augustus. This tract, he justly says, is still able to support a score of cities. At the same time, he objects to the theory which would find "Hyllis" in the rocky tongue of Sabbioncello, which is distinctly alluded to by Seylax (cap. 23).

Finally, we are tolerably sure about the Nestus river and its accolæ, the Nesti. The stream cannot be the Titius or Kerka, because the course of the Periplus is evidently southwards to the Naron, which it names; the latter is clearly the Narenta, or river of Mostar (old bridge) with its "island 120 stadia in circumference," still represented by the site of Fort Opus. Nothing, therefore, remains for it but to be the Tilurus or Cettina. Fortis holds the Nestians to be the people of the modern Primorje and the riverines of Cettina. This coast, fronting Brazza, Lesina, and Sabbioncello, was called, in the middle ages, Parathalassia, which the Slavs translated by the synonymous Primorje (along-sea). In the days of the Avar invasion it took the name of Paganía, from the Poganin or pagan Illyrico-Serbs who tenanted it; and, subsequently, the Archdeacon of Spalato, Giovanni Tomaso (in Lucio di Traù),\* preserved the barbarous "Maronia," also a synonym of Primorje.

Prof. Lanza would place the Nestoi in the highlands of Pogliza or Poglizza; the ghats north of Dalmatia Proper, extending from Clissa Fort (Spalato) to Duare Town, or between the debouchures of the Xarnovizza and the Cettina streams. The name of this rugged oak-clad country, which has not, and, probably, never had a city, is by no means unknown to modern history; and its annals are so curious that I am tempted to a digression. According to Fortis (ii. 92, Fr. ii. 124-128), who ably sketches the picture of the last century, this little aristocratic republic, never containing more than 15,000 souls, freed itself from the Porte, and, like its sister, Makarska, in A.D. 1646, threw itself into the arms of the "Serenissimo Governo," (Venice).

\* Thomas (nat. A.D. 1200, ob. 1268) wrote the "*Historia Salonitanorum Pontificum atque Spalatensium*." Joannes Lucius has left us the valuable "*History de Regn. Dalm. et Croatiae*." He died at Rome in 1679, and his valuable MSS. are supposed to have been neglected.



Society was divided into three classes, which suggest the Sixties and Four-candles, the Forties and the Twenties of aristocratic Guernsey. The first consisted of 20 noble Hungarian families, whom troubles had compelled to emigrate; the second were Bosniac (Christian)\* nobles; and the peasantry represented the third. On the Fête of St. George† (Greek, April 19; Latin, April 23), an annual Zbor, Diet, or Assembly met on the plain of Gatta for the election or re-election of magistrates, each company camping apart. The Veliki-knès (Knjaz, or Knight), the "Great Count" of Fortis, was always a Hungarian; the electors or little counts, Bosniac nobles, represented the village communities which they governed. Whilst the Governor was being chosen, the plebs held their comitia to elect the local chiefs for the next year, or to confirm those who deserved the honour. The "First Order" chose a captain and two procurators to supervise the voting, and election riots were common; whilst the "voto segreto" or "scrutin" was proceeding, some zealous partisan would seize the box containing the provincial privileges (cassetta de 'Privilegi del Paese), which the law committed to the keeping of the Great Count, and run away with it to the house of his favourite candidate, in which case the latter became "bello ed eletto." The difficulty of this proceeding was that all the electors might shoot at him, chase him with their khanjars (long Turkish daggers), or throw stones, in which exercise they are proficient, like the Syrians. The laws of the Poglizani preserved the rudeness of the ages from which they date. In cases of land disputes, the judge repaired to the spot, sat upon a cloak or rug to hear the pleadings, and pronounced a decision, from which, usually, there was no appeal. After a murder, the local court or governor and his notables went to the criminal's abode, and ate and drank him out of "house and home"—a form of "dragooning" well-known to all Easterns—and, finally, the Great Count and his comity pillaged all that remained. Formerly assassins were stoned, and this patriarchal custom long endured in the modification which bears the name of Judge Lynch. For simple

\* Many Dalmatian families derive themselves, truly or falsely, from the nobles of Bosnia, as we do from the Normans. Lovrich (p. 213) shows the difficulty of genealogy by the system of taking the father's name as surname; e.g. Philip, the son of Mark, would be Marcovich. He shows us the gradual growth of family names. "Quanto meglio la intendono i Dalmatini di oggi giorno (parlo di quelli, che non si vergognano del cognome Slavo, e che non lo Italianizzano) a non mutar cognomi da padri in figli, ma quello che lasciano i padri, tramandano ai figli, ed ai nipoti."

† An Illyrian proverb, cited by Lovrich (p. 78) is "Jurjev danski Hajduki sastanski;" "George's Day; bandits array," because at that time the woods became leafy enough for ambushes. If it rain on St. George's Day, cereals will be abundant.



manslaughter, unaccompanied by atrocity, the "platiti karvarinu" (lit. blood spilt),\* or blood-money, the *Diyat* of Moslem law was fixed at "quaranta tolleri," \$40 or 8 zecchini (each = flor. 4.75—5). The object of the fine was to prevent the criminal appealing from the decision of the Great Count to the Venetian *Provveditore Generale* of Dalmatia.

Those remnants of the blood-and-iron ages, ordeal by fire and boiling water, were common, and bore the usual results, injuring and even permanently maiming the innocent, and allowing the sturdy ruffian to escape punishment. One form was worthy of Persia in the last generation: splints were thrust under the finger-nails; the material was always the "sapino" (*Pinus maritimus*),† because specified in the statutes, and the people would tolerate no innovation.

The Poglizzan Morlaks were a robust and well-made race, and Fortis gives them a good character, despite the patriarchal barbarity of their code. Sober and hardworking, they could boast—

Durum a stirpe genus, natos ad flumina primum,  
Deferimus, sævoque gelu duramus et undis.

They made a practice of bathing the babes in icy streams. These Morlaks were, and are, excellent irregular troops, and they were humane, hospitable, and friendly to strangers, except when their ready suspicion was aroused. They even refused to speak of old documents, or to show inscriptions, lest the stranger who could read them should find treasure. Like certain identical institutions amongst different nations, this wariness belongs to a particular stage of development, and must not be attributed only to race.

The village of Pirun Dubrawa (forest of Pirun) preserves the remembrance of the god adored by the Slavs of the city and province of Novgorod, before its conquest by Ivan Vassilovich, Grand Duke of Muscovy. As the old Pagans worshipped Vid, so the Christian Poglizzans have an especial devotion for St. Vitus, and celebrate his festival by burning odoriferous woods round their huts. Believing that if the perennial ice be

\* Fortis, Lovrich, and Wilkinson all write *karvarina*; though the root is *kerv*, blood. Hence south of Cattaro the *Kervosje*, popularly written *Crivosje* tribe. The Morlaks fixed blood-money as high as 50, and even 60 sequins.

† The tree flourishes all over the coast and the islands of Dalmatia, except where the winds are too strong: I need hardly say that in the present state of civilisation no use is made of it but fuel. Yet it might take rank with the growths of the Thuringian mountains, which now supply the "forest-wool products and preparations," cloth, yarns, waddings, oil, spirit, balsam, and soap, medicinal articles so much used in cases of catarrh, rheumatism, arthritis, and even paralysis. Dalmatia still imports these articles from Trieste, with the pine growing all around her house. Yet the Morlaks (Lovrich, p. 11) used "*pece di sapino*" in obstructions and phthisis.

removed from their mountains, the Bora or north-easter would increase to the ruin of their farms, they object to collecting and shipping it. Like all Morlaks, they are exceedingly jealous and yet they despise the sex, and hold the name so impure that it is never mentioned without a "saving your honour's presence." *De prostité, moya zena\** is the equivalent of the Maltese "*Con rispetto (or con perdono) parlando, la mia moglie,*" as if his wife were something impure or offensive. Fortis seems to think this contempt justified by the personal neglect of the women after marriage, but does he not confuse cause and effect?

The churches of Poglizza affected the Slavonian liturgy, and were served by the Glagolitic fathers of Almissa, who also laboured amongst the islandry. The military spirit is not extinct in a hardly accessible land, where every man is a man-at-arms. The mountaineers made a determined stand against the Napoleonic occupation in 1806. More than once they have threatened Almissa, and discharges of cannon are the only things which they respect. Poglizza meridionale, the maritime lowlands, are well-planted with fruit trees, and are now well known, because they supply Zara and Spalato with the best Marasch cherry, the basis of "*Maraschino di Zara.*"

Returning to that debated ground, the Hyllie Peninsula, I may observe that some local antiquaries have been so enthusiastic as to find the sepulchre of Hyllus in the fine sarcophagus which has been placed for protection in a chapel dedicated to St. Cajo the martyr. Its triple division, representing three of the labours of Hercules, is described by every traveller. The learned Wilkinson, however, has neglected (i. 162) to notice, in the third or eastern compartment of the triglyph, the confusion of the Birds of Stymphalus with the Apples of the Hesperides.

Prof. Lanza considers the existence of Herakleia established by two coins in his fine collection; one with a metric diameter of 0.024, bears the head of a youth guardant right, and covered with a lion's hide (*Herakles Imberbis?*); on the reverse are the bow and the club, contained in a circle, and based by the exergue *HPA*. The second (0.013—0.016) bears the same obverse, but on the other side the bow and club are not in a circle, and the legend is *HPAKL*. Both have the letters

\* Lovrich (p. 164), in the days before Slav orthography was fixed (1777), writes, "*S'prostegniem nasce xene, nasce chieri, nasce rodizce*" (*con perdono, nostre moglie, nostre figlie, nostre parenti,* &c.), which must be pronounced Italianistically, and he tells us that there is no excusatory formula when naming a man, the latter being nobler than "*que 'sporchi, vili e sozzi animali,*" as the Morlaks hold women to be. The idea is probably the result of an ultra-Spartan affectation of manliness and contempt for effeminacy.

well raised, and are tolerable specimens of the Greek type. According to Strabo (vii. 5, i. 484), who notices the redistribution of lands every eighth year, the Dalmatæ did "not use money, which is a peculiarity also when compared with the habits of the inhabitants of this coast; but this is common among many other tribes of barbarians." The Romans had no mint in Dalmatia, and only during the decline of the Byzantine Empire, Cattaro, Ragusa, and Spalato established their respective "Zecche."

Two medals of the Herakleian type are found in the I. R. Ginnasio Superiore of Zara, and are described by the Abate Simeone Gliubich (*Numografia dalmata*, in Italian, printed in vol. ii. "Archiv für Kunde Österreichischer Geschichtsquellen," and in the Slavic "Arkiv za povelstnicu Jugo-slavensku, Knjiga druga," Razdel i.) Heckel (Pt. i. "Catalogus Musei Cæsarei Vindoboniensis, numorum veterum") figures, in fig. 1, tab. ii., a roughly made coin, with bow and club, and the exergue *HPAK*; and in p. 47 he ascribes it to "Heraclea Taurica." He is supported by Sestini (*Moneta vetus urbium, populorum et regum*). On the other hand, the late Pietro Nisiteo, of Cittavecchia di Lesina, a distinguished student of Dalmatian antiquities, "proved," says Dr. Francesco Danilo (p. 173, "Programma dell' I. R. Ginnasio Completo di Prima Classe in Zara," 1849—1860; "Zara Tip. Governiale," 1860), "that these and other congeners belonged to the Illyrian Heraclea, mentioned only by Scylax Caryandensis, and placed on the sea-shore near the Liburni; in this opinion he was followed by Gliubich." The only "Congenero" I can find noticed is a feminine head, coiffée with a bushel, and guardant right; on the reverse is a fish, naiant dexterwise; the diameter is 0.02, and the material copper, silver being the only other metal used.

Prof. Lanza's two medals were found near Spalato; but this proves nothing; coins travel as far as beads, Holloway's pills, and cowries. My old friend, W. S. W. Vaux, writes to me that either or both may belong to Heraklæa of Thessaly, or Heraklæa of Bithynia (Taurica), which had the same type and legend; but that, without seeing the coins, it is impossible to assign the place of fabric—it can only be said that the Bithynian are the more common. To this objection Prof. Lanza rejoins, that the same type might also have been assumed by a third Herakleia, "Mentre sappiamo come gl'antichi popoli nella fondazione di nuove colonie accostumassero talvolta imporre a questo il nome ed adottare gli usi della madre patria." "At any rate," he concludes, "the find proves a commercial intercourse with the Grecian cities further east."

I visited Salona for the first time in company with Professors

Lanza and Michele Glavinić, Curator of the I. R. Museum at Spalato; the unaffected kindness of this *savant*, and his ready sacrifice of valuable time, have endeared him to a number of our countrymen. The act of escort was all the kinder in such weather; far from tepid was the turbid Iader, and no soft zephyrs were the storm-winds. The shape of the old city has been compared with a rudder, the base eastward, and the narrow part to the west. Fortis (ii. 45, Fr. ii. 59) has noticed the corruption of Cæsar's text (Bell. Civ. ii. caps 8, 9) "Salona, in edito colle," when the "oppidum munitum" lies in the riverine valley of the Iader, or Giadro; possibly, however, the conqueror may have included the fort of Clissa, the Andetrium of Pliny (iii. 26), which Fortis (ii. 48) writes "Mandetrium," and the Anderium (*Ἀνδήριον*) of Dion Cassius (lib. lv.). Here I saw at once the form of the double city, which, after the fashion of Athenæ and Thebæ,\* converted Salo, Salon, and Salona, into Salonæ. The base of the word may be Keltic, with the terminal *on*, or *ona*, signifying a town—as Albona (high town) and Lisbona, to mention no others. The chronicler, Thomas Archidiaconus (nat. A.D. 1200), derives Salona from Salo, the sea; Rosacci from Calone (Joktan?) son of Salah (*Σαλὰ*), son of Arphaxad (Genesis x. 25). Ortelli has doubts about the identity of Salona with the Salangon of Apollonius Rhodius (Carrara, p. 1). The Greeks, Strabo (vii. 5, § 5, loc. cit.); Dion Cassius (lv. p. 586); Ptolemy (ii. 17, 4, viii. 7, 7); "Pæonio ix." (? Pæanius, Epitome of Eutropius); Procopius (di Bello Goth. i. 7); Zonaras (Chronicon. De Diocletiano), and others use *Σάλο*, *Σαλῶν*, *Σαλῶνις*, and *Σαλῶναι κολονία*. Amongst the Latins we find the old marbles (Gruter, "Inscript. Ant. Amstelodamæ," 1707); a leaden tube of the aqueduct; Pliny (iii. 22); Mela (ii. 3); Hirtius (de Bell. Alex. cap. 43); the Anonymus Ravennæ ("Europa," lib. iv. No. xvi.); Jornandes (De Regnorum Success., cap. 58); and the old martyrologies preferring Salona, næ. The inscription referring to the road between Salona and Andetrium ("Lucio Inscript. Dalm.," p. 34; "de Regn. Dalmat. et Croatiae," p. 34; Cæsar ("de Bello Civ.," iii. 8); Lucan (iv. 4); Vibius Sequester (Glossary); M. Aurelius Antoninus (Itinerarium) affect the less usual Salonæ, narum. So states Carrara (loc. cit. p. 1), but the use of the plural has evidently its reason. Colonia Martia Julia Salona, occurs in an inscription (Gruter); Col. Jul. Salona on a medal of Claudius (Goltz de re nummaria Antiq.); Col. Claudia Augusta Pia Veter. Salona, on a coin of Tiberius; fragments of pottery have Salonas, and others, according to Farlati,

\* *Ἀθήνη* and *Θήβη* (the Greek and the Egyptian), I need hardly say, are both used; but they would signify the old, or official town.

(III. Sac. i. 27) Silena. The names of the citizens and the adjectives are *Σαλῶνες*, preserved in the Acts of S. Domnius (Salones); Saloni<sup>us</sup> (*e.g.* Salonia quercus) in Claudian and Servius; Saloneus in Priscus the Byzantine (A.D. 445); and Salonites in Stephanus Byzantinus; the most general are Salonitanus and Salonensis. Three other Salonæ are mentioned by the classics, one in Bithynia, a second in Gallia Narbonensis, between Marseille and Avignon, and a third in the Gulf of Corinth.

I am compelled to differ with my learned friend, Prof. Lanza, who, against the opinion of Carrara, believes the eastern to be the older portion of the double city. The western part contains the little theatre, the Thermæ, which have evidently been converted into an early Christian baptistery, and the amphitheatre, which would hardly accommodate a large and opulent community; its long oval is only 86 metres, and Mr. Paton reduces it to 126 feet. Again, the double Porta Cæsarea, the city gate\* separating old town from new town, has the towers (G) projecting eastward, and the re-entering form is by no means the rule in Roman fortification. Carrara makes this royal approach connect the old Greek town with Julia Martia Salona, as the western gate of Diocletian's palace, popularly called Porta Ferrea, united it with the suburb. Moreover, in the most massive and the earliest part of the north-easternmost angle (about F), near the Porta Andertia of Carrara, I saw a Roman inscription built up in the wall, and several others are recorded by the learned Abbé, suggesting a comparatively modern origin. Finally, the western half has for its northern boundary the eastern part of the "Murazzo," or "Muro Ciclopico," and, like the long walls of the Piræus, the western part of the venerable fragment may have been left as a defence, commanding the high road to the Syracusan city Tragurium (Traù). Thus, I would believe, with Wilkinson, the long wall of Salona to be Greek, not Roman, and with Carrara to be pre-Roman.

## PART II.—THE RUINED CITIES OF PHARIA AND GELSA DI LESINA.

My conviction that the long wall of Salona is Greek and pre-Roman relies also upon the fact that similar constructions exist in the neighbourhood. Fortis (ii. 56, Fr. ii. 76) mentions them at Stobrez (Stobrech), east of Spalato, the Epetium founded by the Siculo-Issani, the Syracusan colony which held the island now called Lissa: "Veggonsi ancora lungo le rive del picciol

\* This double form gave rise to the Greek *πόλαι*, and we still see the grooves for the Cataracta, which the modern Italians call *Saracinesco*. This man-trap was a portecullis, let down from above like the gate of a sluice by chains, and imprisoning those who had forced the outer entrance (Dennis, ii. 160).



Porto riconoscibili vestigi delle antiche mura d'Epezio, ch' erano fabbricate bensì di solidi materiali, ma senza quella squisitezza di connessione, che si ammira nelle fabbriche Romane." There are also ruins of a Cloaca; the parish church, distant one mile from the fort which defended the land side, is built upon the old walls; and the foundations of a tower may still be traced. Fortis (i. 33) carefully distinguished these Greek remains from the Roman ruins, those, for instance, at the modern Podgraje (*i.e.* Pod-grad, under the city), the Asseria or Assesia of Pliny (iii. 21, Bohn i. 258). Here the walls are described as 8 to 11 feet thick, 8 feet high, and "lavorate a bugna" (draughted and bossed).

The Spalatines spoke of classical ruins in the island of Lesina, which was undoubtedly colonised by the Hellenes; and my attention was drawn to one not mentioned by any foreign traveller, when reading the useful "Manuale del Regno di Dalmazia (per l'anno 1873, compilato da Luigi Maschele, Consigliere Imperiale," anno iii. Zara Tip. Fratelli Battara, 1873). The following passage occurs in p. 103: "GELSA—JELŠA.\*—*Monumenti antichi.*—Due vetusti interessanti fabbricati trovansi nelle vicinanze di Gelsa, entrambi posti sopra eminenze a mezzogiorno della borgata ed alla distanza di meno d'un miglio da essa. Il più antico e posto a cavaliere d'un monte. Questo edificio, o a dirsi meglio questo avanzo di antico monumento, viene comunemente denominato *Gor* (read *Tor*) in lingua Slava. La fabbrica presenta un' opera di lavoro *ciclopico*, e fra i tre generi di tali lavori quello che veniva costituito di massi regolari di forma quadrilunga già soprapposti uno all' altro senza cemento. Anche l'intero (interno?) fabbricato è di forma regolare, quasi pienamente quadrilatero. Per rimontare alla sua origine, bisogna ascendere ai tempi di *costruzioni ciclopiche*, che, come si sa, sono anteriori di più secoli all' era volgare. Lo scopo di tale fabbrica non può ben determinarsi; isolata, posta sopra un monte di accesso aspro ed arduo, di non troppa estesa, non saprebbe conciliare in essa un' idea di abitato, e nemmeno di fortificazione, perchè senza argomenti di difesa. Forse più accettabile sarebbe l'idea, che si trattasse d'un tempio antichissimo. Ad ogni modo il monumento rimane interessantissimo alla curiosità ed alle ricerche archeologiche e storiche. L' altro monumento, a non molta distanza dal primo a levante, eretto anch' esso a cavaliere d'un' eminenza, chiamasi *grad* in slavo, che corrisponde a *città* o *cittadella*. Per il genere di costruzione con pietre comuni ed a calce, per la distribuzione interna delle mura, per l' esistenza entro tale circuito di avanzi d'una Chiesa Cristiana

\* The first form is Italian, the second is Slav, pronounced Yelaha.

con entro una tomba, e per l'applicazione degli avvenimenti storici del luogo si deduce, che la fabbrica stessa rimonti a tempi ben conosciuti e storici, ed abbia avuto per oggetto la costruzione d'una fortificazione per ritirata e ricovero degli abitanti da incursioni nemiche nel sottostante paese di Gelsa, che si sarebbe inclinati a riferire—anzichè alle incursioni turchesche che non possono ascendere in su del secolo xv,—alle incursioni dei secoli anteriori, e probabilmente a quelli dei Saraceni sopra l'isola di Lesina."

Here, then, was at least one object well worth the traveller's study. My good friend, Sig. Francesco de' Vitturi, A. H. Lloyd's agent at Spalato, managed the transport for me. MM. Paolo and Luigi Palese, civil engineers constructing the mole and new port which are to connect with the Spalato-Siveriè Railway, the first of its kind in Dalmatia, kindly lent me their little paddle-wheeler, "*Messagero*," and absolutely refused to be reimbursed, even for the expenses of crew and coal. On Monday, December 28th, we steamed out, despite the furious sirocco or south-easter, one of the twin tyrants of these seas, which was blowing great guns in the offing. Spalato, by force of situation, which determines the rank of the world's cities, almost monopolises the rich trade of Bosnia, comprised in cereals, hides, wax, and orpiment; silk, wool, and cotton, "*lihafs*" (bed-coverlets), copper pots and metals, iron, and perhaps gold and silver to come. The staples of local production being oil and wine, great efforts are being made to improve them; and the Œnological Society, worked by my friend, M. Aristide Vigneau of Bordeaux, is doing much good, not only in making money, but in teaching the peasant on the islands as well as the main, a new lesson, to prefer quality to quantity. The port is not only the single settlement in the old kingdom which, I have said, shows any sign of progress, she is also the sole one that boasts of a truly beautiful approach. Yet when Eurys is abroad, making the sea high and the currents like mill-races, the noble amphitheatre, with its "peak of lapis lazuli rising in majestic splendour to the sky," the "imponente baja," as Dr. Lanza justly entitles it, is compelled to veil its charms from the admirer's eye. Thick whirling mist-clouds cap the straight dorsal lines of Mons Caprarius, the Kozjak or goat-mountain of the tradition-loving Slav; the snowy peaks of Mons Auri (Mossor), which supplied the precious metal\* to the Roman capital;

*Ibis litoralis* Macer, Salonas;  
*Felix aurifera* colone terræ.

\* Lovrich quotes Pliny (Nat. Hist., xxxiii. 4), "*ut nuper in Dalmatia, principatu Neronis singulis diebus etiam quinquagena libras fundens, cum jam inventum in summo cespite*," and prefers the Mossor of Promina to that of Olissa as the origin of this gold.

and the regular, white-grey cone of Biókovó, still retaining in translation (Albicans or Albeggiante) the Albius and Adrius of the classical occupants. The rack cowers before the blast low enough to hide the gap of historic Clissa, and Monte Mariano gleams ghastly white against the angry purple sky. The deep blue of the Adriatic changes complexion to an unnatural ghastly green, upon which white horses course, rear, and fall; and the bold and beautiful outlines of the islands fronting the baylet are hidden by a curtain of cold grey fog.

A few words concerning the Dalmatian archipelago, and especially this section of it. Fortis justly describes the islands as the sad remnants of a land which has been torn by torrents, mined by subterranean streams, shaken by earthquakes, and finally submerged by a new sea. In vol. i. p. 18, he asserts "*il mare guadagna continuamente sopra Zara;*" and he gives many names of submerged cities between Istrian Sipar (the Roman Siparum) destroyed in the ninth century, and the Bocche di Cattaro. Such are the flooded remnants of old Scandona, at the Lake Morigne, north of Sibenico; Nona, north of Zara, where the new settlement, called Privlaca by the Morlaks, is the Brevilacqua of the Zaratines, the Latin "*Brevia aquæ,*" or shallows; the ruined wall at the entrance of Makarska port, and the remnants of Narona, now under the swamps of the Norin river, the northern affluent of the Narenta. Even at Venice, in the sixth century, it was found necessary to defend the mouths of the cisterns from seawater by raising the masonry. The whole coast of Primorje (Dalmatia Proper) has sunk, as may be seen by the sluggishness of the debouchures affecting the climate, which once was so much praised. At Lissa Island there are pisolithic cliffs, and at Lesina and other items of the Archipelago there are large tufaceous beds of rivers, apparently proving an original connexion with the coast. Finally, at the Pelagosa rock, called the "last Austrian ironclad," a long dot of land seamost of the whole archipelago, where a fanal is now being placed, two tusks of an extinct animal are said to have been found in the calcareous tufa, whose age, denoted by splendid Venuses, especially the *Pectunculus (pelosus?)* which still lives in the Adriatic, cannot be of great date. When Sig. Topich, mayor of Lissa, and now H.M.'s vice-consul, under whose charge is the historic cemetery of our seamen, was removing stone for the lighthouse platform, he came upon an artificial cistern or gallery, containing human bones and other matters, concerning which he has sent me notes and plans for the Institute.

Whilst the Dalmatian Sea is believed, since the days of the Paduan Vitaliano Donati (nat. 1717; ob., Bussora circ. 1760), Manfredi, and Zendrini, to have risen, that is to say, that the

shore has sunk and is still sinking, it is generally held that the maritime part of Adriatic Italy has risen, even since classical times. This seems proved by the site of Etruscan Adria, which named the great gulf;\* once upon the coast, it is now twelve miles inland; and the same is the case with Padua, Rimini, Ravenna, and Spina towns. This slow but persistent upheaval suggests the shores of the Baltic; and in neither case can the phenomenon be explained by the constant erosion and consequent deepening of the sea, which Mr. H. P. Malet proposes to substitute for secular upheaval. When, therefore, a modern writer states of Dalmatia, "è poi ben conosciuto che la sponda nostra dell' Adriatico gradatamente acquista sul mare," he evidently confounds the eastern with the western coast.

The drowned continent of the Dalmatian shore first consisted of riverine and maritime plains; these were raised by the earthquake and the volcano to hills, and, lastly, they sank below the sea-level. This theory, if correct, would give an indefinite lapse of ages for the formation of the archipelago. The older geologists made the depression synchronous with the bursting of the Atlantic into the Mediterranean basin, and thence through the Bosphorus, events usually placed at the beginning of the glacial, which followed the first quaternary, age. Geologists still hold that in the second period of the stone-age Scandinavia, Jutland, and the Danish Archipelago were connected into a single continent. And the process of island-making still continues. The bold and serrated peninsula of Sabbioncello is supposed once to have been the left bank of the Narenta embouchure; it is now connected with terra firma by a narrow isthmus, and the sinking of a few feet will reduce it to sea-level, causing total insulation. Between the Quarnero Gulf and Spalato the northern section of islands and islets, often in double chain, subtend the shore-line, whose trend, to speak roughly, is from north-west to south-east, and, as a rule, they present two parallel ridges of high ground, as if a continent had been shattered into a hundred fragments. The double chain of sunken mountains, broken by bays, sounds, and inlets, seems, when viewed from an elevated point of the coast, to fit into the terra firma as if once joined on to it. But about the parallel of Punta Planca, the westernmost projection of Dalmatia, the shore-line bends into an important chord concave to the north, and here the chief islands, Brazza, Lesina, Lissa, Curzola, and Lagosta change from a diagonal (north-west—south-east) rhumb to a parallel of latitude, the length of all four being disposed almost due east and west (magnetic). Finally, further

\* A few, but very few, have called the Adriatic from Adria (Hat or Hatri, *hód. Atri*) of Picenum, the modern Abruzzi.

south, as far as the Bocche di Cattaro, where the archipelago abruptly ends, the groups re-assume the diagonal trend of the northern section.

We had some grief in traversing the Canale della Brazza, between that island and the continent, and again the little steamer was heavily shaken by a cross sea in the Canale da Greco di Lesina, which has Brazza to the east. Fortunately, however, my kind-hearted and obliging friend, Cav. Pietro G. di Leva, an old Pacific voyager, now port-captain of Spalato, had taken the precaution to send with us Gospod Dumantich, his chief and most experienced pilot. After four hours, we found ourselves running S.E. in smooth water, with Port Pellegrino to starboard, and the highlands of Port Kubal to port. At the bottom of the bay lay Cittavecchia, or Starigrad, and here I was hospitably welcomed by Capt. Pietro Ivanisovich, the Podestà or mayor.

The island of Lesina, says Capt. Giacomo Marieni (pp. 331—349), in that fine folio the “Portolano del Mare Adriatico,” (Milano, Dall’ I. R. Stamperia, 1830) is one of the largest and the most populous of the Dalmatian Archipelago. Its length from east to west is thirty-seven (Italian) miles, whilst the breadth varies from two to three. Fortis gives these figures forty-four, and a maximum of eight. Until the early part of the present century it was well wooded; its forests of the *Pinus maritimus*, which Linnæus ignored, combined with its peculiar, long, narrow shape, gave rise to its two known names, the original Liburnian having wholly lapsed into oblivion.

The Greeks called it Πάρος or Φάρος, which we find in Scylax Caryandensis (chap. 23) ἐνταῦθα γάρ ἐστι νέος Φάρος, νήσος Ἑλληνὶς, καὶ Ἰσσα νήσος, καὶ πόλεις Ἑλληνίδες αὐταί. Appolonius Rhodius, describing the passage of his knight-errants, the Argonauts, terms it Πιτυεία, or pine-island (πιτύς = pinus) in this verse (iv. 564):

Ἰσσα τε, Δυσκελαδὸς καὶ ἱμερτὴ Πιτυεία.

Upon which the Scholiast remarks, Δίγουρνοι ἔθνος οἰκοῦντες ταύτας τὰς νήσους, Ἰσσαν . . . μεθ’ ἧς εἰς Κέρκυραν ἦλθον. τὴν δὲ Πιτυούσσαν καλουμένην Πιτυείαν εἶπεν Ὀμήρῳ ἐπόμενος. Some authorities have applied “Pityeia,” without sufficient reason, to the wooded rock of Sant’ Andrea, where pitch was drawn by incision. “Dyskelados,” according to Fortis (ii. 163; Fr. ii. 222), is the title of Issa (Liessa); the “harsh-sounding” is generally understood to be Cratia (Κρατία), Crathis (Κράθις), Bractia (Βρέκτια), or Brattia, the Βάρτζω of C. Porphyrogenitus, and the modern Brazza, still so heavily visited by the howling Bora (north-easter). Pliny (Nat. Hist. iii. cap. ult.) applies to



the fifty islets and rocks of Sibenico the collective name of Celadussæ, supposed to be derived from Dyskeladoi; and Fortis (i. 170, Fr. i. 235) thus amends the corrupted text, "Nec pauciores Trucones (insulæ) Liburnicæ. Celadussæ contra Surium (Zuri Island). Bubus (Bua of Spalato), et capris laudata Brattia."\* Scymnus Chius (Periegesis, l. 427) adds another detail:—

Φάρος δὲ τούτων (the Illyrians) οὐκ ἄπωθεν κειμένη  
Νῆσος Παρίων κτίσις ἐστίν.

Diodorus Siculus (xiii. 3, 4) relates the decree of the oracle which determined the Parian emigration, and dates the foundation of Neo-Paros from the year "when the Elæans were celebrating the 99th Olympiad (B.C. 385). The new-comers expelled the barbarians, who took refuge in a very strong village, and quickly founding their city near the sea, walled it round and held it for 166 years. Strabo (vii. 5, s. 5) refers to it as *Ἡ Φάρος, Πάρος λεγομένη πρότερον*. It is the *Φαρία* of C. Ptolemy (ii. 16, s. 14), who applies the term to isle and capital, and the *Φάρα* of Const. Porphyrogenitus (De Admin. Imp. cap. 36). The Romans, as we learn from Pliny (N.H. iii. 30), preferred Pharia, probably pronounced Pharía, and the Slavs, who convert Ph and F into Hv (= Kh in such Persian words as Khar and Khwár), have retained Hvar, evidently from Phar(ia) or Far(ia). "The name is given in ancient documents to the island and, after the foundation of Lesina town, to Cittavecchia."†

There can be no reasonable doubt of this identification when we inspect the coins turned up at Cittavecchia. In the days of Fortis (1772) a single specimen was known. Prof. Boglić (loc. cit. p. 18) mentions but three silver in 1873, one described by Sestini, a second owned by Sig. G. Macchiedo, and a third in his own cabinet. The "Programme" before alluded to describes (p. 171) five copper medals in the Gymnasium of Zara, not to speak of the many preserved elsewhere. The characteristics are the virile heads, bearded (Jove?), or imberb, nude, laureated or crowned, and guardant dexter or sinister. The reverse often shows the goat (Caprone), derived from Paros of the Cyclades, and No. 5 bears four rays above it. Prof. Lanza's copper specimen seems to have an olive branch over the animal's crupper. The exergue is Φ, and the diameter varies from 0.019 to 0.024. Prof. Ljubić (or Gliubich), of whom more presently, declares (p. 8) that the different types found at Cittavecchia exceed one hundred, a number surpassed by few ancient cities.

\* Bostock and Riley (Bohn i. 266) thus pervert the passage: "Opposite the Liburni are some isles called the Cratæ, and no smaller number styled Liburnicæ and Celadussæ. Opposite to Surium is Bavo, and Brattia famous for its goats."

† This statement of Prof. Ljubić (p. 33) is contradicted by Prof. Boglić (p. 34).

He gives as the chief obverses the heads of Ceres and Homer; the reverses bear the serpent, the goat, the pine, and the two-handled wine-jar, emblems of agricultural prosperity; the exergues are mostly  $\Phi A$  and  $\Phi AP$ , sometimes  $\Phi API\Omega N$ , and  $\Pi A$  (Boglić, p. 18) in only one specimen found at Lesina town.

According to Sig. Giacomo Boglić (p. 31, *Studj Storici sull' Isola di Lesina* di G. B. Prof. nell' I. R. Ginn. di Zara: Zara Tip. di Gio. Woditzka, 1873, Fasc. 1, pp. 5, 31), the Slavs originally called Pityeia "Lisna," and subsequently Lesna, Liesna, Liesena, and Lesina. He quotes the Lesignano, Vinc. Priboivo (Venetiis, 1525), who terms it "Lisna," adding, "corruptius autem Lesina dicitur." Yet Prof. Ljubić (p. 30, "Faria," &c.) notes that in a document dated June 19, 1103, by Koloman (A.D. 1095), son of St. Ladislaus, of Hungary, and quoted by Lucio (vi. c. 4), and Farlati (iii. 164) has "et villam Lesina Stolez." Ambrogius Calepinus (p. 226, "Onomasticon propriorum nominum. Basilie," 1598) speaks of the "insula quæ nunc vulgo Lisna Illyrico sermone dicitur." Prof. Boglić would derive Lisna (the woody) from Lies (a wood), quoting the *Lexicon Serbico-Germanico-Latinum* (p. 328, Edidit Vuk Stef-Karadschitsch, Vindobonæ tip. Mechit., 1852) "Lies (u Hcegovini) *Silva*. Blagi jezika Slovinskoga (in the blessed Slav tongue), (p. 232, Laureti, 1694) *Lis, Lies*. To jes driva za poslovati (i.e. wood to work). . . . *Lignorum apparatus*. In Bosnia there is a Mount Lisina and a River Liešnica; Serbia owns three villages called Lješnica, and at Rudine, near Cittavecchia di Lesina, we find the Valle Lesnà and the Punta Lesnirat. As the Slavs make little difference in the articulation of the i, the e, and the diphthong ie, the name was written in the public documents of Venice indifferently Lisna, Lesna, Lesina, and Liesina. Finally, in the early 19th century, the shape of the island suggested the modern and popular Italian form "Lesina," meaning a "cobbler's awl," and the true term (Lisna) lapsed into oblivion.

According to Professor Boglić, the island abounded in pre-historic or proto-historic remains, whose origin he wisely hesitates to determine. His description is as follows (pp. 7 & 8):—

"Monumenti sepolchrali ci restano sull' isola, e molti intorno alla città di Lesina, i quali senza dubbio rimontano all' epoca seconda dell' età di bronzo. Parecchi ne furono aperti, sono dodici anni circa (about 1861), per cura dei Signori Gregorio Bucić e Pietro Boglić. Erano essi formati da grosse lastre di pietra non isquadrate, lunghi dai tre ai quattro piedi, larghi due, e a un dipresso altrettanto alti. Enorme la grandezza del coperchio, e di alcune delle lastre laterali poste sempre per coltello (on edge).

“Ecco quello che mi scriveva il Sig. Gregorio Bucic riguardo il coperchio—‘una sola era la lastra che serviva di coperchio, e sempre massiccia assai e greggia—una volta massiccia tanto che conviene frangerla col farvi cadere dei grossissimi sassi, essendo stato impossibile sollevarla a braccia, sebbene molti operai si lavorassero intorno.’

“E siccome non poterano estrarsi sopra luogo, chè a ciò non prestavasi la natura del terreno, fanno suporre sforzi e fatica somma, perchè potessero trarsi lassù senz’ aiuto di macchine. Queste tombe costruite sopra terra, senza calce, sempre in cima di qualche collina, protette erano dalle ingiurie del tempo e degli animali da un tumulo di sassi, alto fine a dieci piedi, di una periferia che talvolta aggiungeva i cento, e la cui sommità finiva per lo più in pietre di considerevole mole. Le tombe non giacevano mai nel centro del tumulo, ma erano poste alquanto a levante. In una si trovò conservata una parte di un cranio, e dei carboni, in un’ altra pochi carboni, due vasetti di terra cotta; taluna conteneva ossa frammiste di adulti e di bambini. Si raccolse un fuso di bronzo, e dello stesso metallo una fibbia a semicerchio, un anello, un amo, alcune di quelli spirali che sono caratteristiche di quest’ epoca, e pezzettini di ambra.

“I vasi, gli oggetti di bronzo coi pezzetini di ambra allora trovati, si conservano a Lesina dal Sig. Girolamo Machiedo, ma le ossa del cranio, ed il femore furono risepelliti, e forse non erano di minor interesse per la scienza. Il Dr. Francesco Unger, Professore all’ Università di Vienna, rapito troppo presto all’ affetto and alla gratitudine dei Lesignani, avendo esaminato nel 1864, gli oggetti di sopra accennati, anch’ egli li giudicò dell’ età del bronzo.

“Qualche sepolcro era vuoto, nè pare che prima sia stato aperto, perchè non si vide alcuna traccia di lavoro intorno al tumulo, nè appariva che le lastre delle tombe fossero state smosse. In questo non mancava il terricio (*black degraded earth*), prodotto dall’ azione dell’ umidità e del tempo sui resti animali, che vi erano stati deposti. In nessuna si trovarano oggetti di ferro. Molti anni prima alcuni agricoltori, spinti dalla speranza di arricchire con tesori nascostivi, spianarono dei tumuli, e disepellivano un grande vaso di terra senza manico, ed un martello di bronzo, scarso compenso al lungo e penoso lavoro. In uno dei sepolchri da essi aperto, tanti erano i carboni accumulati, da dover sospettare che entro sia stato abbruciato il cadavero. La tomba non era sempre lunga così da contenere il cadavero disteso di un uomo, e siccome da ossa trovate senza tracce di fuoco, si vede, che non tutti i cadaveri venivano arsi, convenien credere, che in qualche caso si ripiegassero; tanto più

che la periferia di un cranio, desunta dalle ossa parietali e dall' occipitali bene conservati, e la lunghezza di' un femore mostrarono, che gli uomini a cui appartenevano erano di statura anzi alta, che mediocre, e di grosse proporzioni. La forma piramidale dei tumuli, il colore, e la grandezza delle pietre che ne costituiscono l'esterna corazza, il sito elevato, sterile, sassoso, su cui s'innalzavano, li fanno tosto riconoscere e distinguere dalle macerie (*heaped stones*) di egual mole costruite dagli agricoltori colle pietre tratte dalle pendici delle colline che dissodano. Devesi deplorare che quando si spianarono i tumuli, nessuno si sia pensato di studiare più attentamente questi monumenti dell' età preistorica. Se con questo scopo e con maggior cura fossero stati eseguiti i lavori, si sarebbero ottenute più precise indicazioni, e forse tra i vari sepolcri sarebbesi potuto rilevare un grado diverso di antichità."

The passage is interesting, because it shows that Lesina contained a style of tumular architecture dating before the Iron age, and thus equal in antiquity to the oldest Etruscan remains which lie on the confines between the Bronze and the Iron.

Cittavecchia de Lesina, the "*Civitas Vetus*," which the Slavs, rendered by "*Starigrad*" (old fenced city), opposed to *Civitas Nova*, Novigrad, or Lesina town, is the usual Veneto-Dalmatian port-town, a gathering of big, dull houses rising from narrow alleys, which were neither paved nor lighted till the reign of the present Podestà. The redeeming point is the neat riva or quay of cut-stone—a luxury found throughout this seaboard from Sibenico to Cattaro, and still wanting on the Surrey side of the Thames. The little port requires a prolongation of the rudimental mole, at whose base stands the Sanità-box, as westerly winds drive, at times, the billows right home, to the imminent danger of the shipping. The four churches, including S. Pietro, the Dominican monastery, do not exceed the usual allowance, and the Parrocchiale and ex-cathedral (?)\* of S. Stefano, which has a *cachet* of its own, bears over the entrance of the belfry this barefaced inscription in the baldest Latin—

*Dederunt hujus primordia molis de mænibus urbis reliquiae,  
Et quæ dederat gressum in urbem janua, nunc in templi sacrarium.*

The people, who number a maximum of 4,000 out of a total of 14,000 to 15,000 islanders, regret that their "city" was not built on the sloping ground a little farther north, where the

\* For the origin of the bishopric at "*Sancte Marie*" (Gospoica, the little "*Plebania*" built in A.D. 1323) de Faria (*Cittavecchia*) and its "illegal" transfer to Lesina town, see Ljubić, pp. 32-37. He is refuted by Boglić (p. 56). The latter quotes (Du Cange, *Glossarium*, Parisiis Didot, 1842, vol. ii. 241) "*Cattedra ipsa sedes seu Ecclesiæ Cathedralis. Eodem nomine designantur interdum ecclesiæ parochiales, præcipue in urbi episcopali.*"

drainage would have been better. High-spirited and industrious, stout fishermen and gallant sailors, they leave their women to till the ground—

*Fœmina pro lana cerealia munera frangit  
Impositoque gravem vertice portat aquam—*

and they take a pride in calling themselves the English of Dalmatia, a distinction which they amply deserve. Their island yields grain enough for five months only; the other eight must be supplied with bread from the Danube and the Black Sea.\* The chief local cereal is barley, the rains not being heavy enough for "fromenton" or maize. Wine is abundant, alcoholic enough to suit the English market, and much resembling the Lavradio and the inferior growths of Port. The olive thrives everywhere, and at this season the streets and stairs are rank and slippery with oil. The Chambers at Vienna, influenced by a great monopolist company, have lately done an unwise and unpopular thing in refusing an annual subsidy of 20,000 florins to an inter-insular line of steamers. The difficulty of intercourse here causes not only inconvenience and loss of time, it also affects the trade of many communities, and renders their progress and development next to impossible.

I at once inquired about the so-called "Muraglie ciclopiche," a term adopted throughout Dalmatia from Dodwell ("Views and Descriptions of Cyclopean or Pelasgic Remains," &c., a paper posthumously affixed to his "Tour in Greece"); from Petit-Radel, who proposed the theory in 1829, and who developed it in 1841 ("Recherches sur les Monuments Cyclopéens, et description des modèles en relief composant la Gallerie Pélasgique de la Bibliothèque Mazarine," Paris); and by Cesare Cantù in 1846 ("Dei Monumenti di Archeologia"). A local antiquary has determined the walls of Pharia to "belong, without doubt, to the second species of Pelasgic construction," the first being "irregular polygons, uncut, or cut after the Lesbian rule, concerning which the author, 'De Mirabilibus,' speaks." Sig. Girolamo Budrovich, formerly Sindaco, and now Agrimensor (land surveyor) of Cittavecchia, has succeeded in outlining the limits of the old city—of course, only the official portion—an oblong measuring about an Italian mile in circumference. The dimensions of the enceinte were 36 feet in thickness, and the height was conjectured to be about the same. Possibly the norm which Fortis applied to Aseria (Podgraje) has been fitted to Pharia. The fragments best preserved are in a cellar (Cantina di Gram-

\* The Raxine is in every mouth; for instance, *Fortuna nel Golfo* (Adriatic) *burrasca in Mar Nero*; and during a storm they will exclaim, "*Poveretti nel Mar Nero!*"



motor), where, however, they are almost concealed by gloom and lumber; outside the town, about 10 metres rise above ground near the Casa Domchich; and the foundations remain in many places uninjured. Hence a description and, I believe, a plan were published in the Instituto Archeologico of Rome between 1840 and 1848.

Accompanied by the gentlemen of the town, I visited these interesting remains, and found the masonry to be pseudo-isodomic and isodomic (regular horizontal layers), parallelopipedons of considerable size, cut from the limestone of the neighbouring hills, hammer-dressed, and fitted upon one another without cement. I nowhere remarked bossed and draughted stones, but Sig. Budrovich assured me that they existed near the city, and he presently obliged me with the following three specimens. The measures are in Viennese feet and inches.



FIG. 1.



FIG. 2.



FIG. 3.

The central projection above the draught is 4 inches in fig. 1; 1 inch 6 lines in fig. 2; and 2 inches in fig. 3.

The good Agrimensor was also kind enough to inform me by letter (Feb. 4, 1875), that about an Italian mile outside the town he had found masonry which appeared to be of the oldest date. Fortis (ii. 176) had previously copied a Latin inscription "perhaps a mile from Cittavecchia."

There has been since the early 14th century—probably long before it—and there still is, a mighty feud between Cittavecchia and her south-western neighbour, the "Hauptstadt" of Lesina, about the right of representing the ancient Pharia of Demetrius of Paros. Fortis (ii. 175), guided by a local tradition, would place the site some two miles further inland, where ruins are also found; these evidently belong to some forgotten item of the five classical towns. In our day the leaders of the war are the two following literati.

Professor Boglić (p. 26, *loc. cit.*) rather "trims" between the two. According to him, the Paros built by the Parians in the 4th century B.C., and utterly destroyed by the Consul Lucius Emilius Paulus in B.C. 219 (Livy, Polybius, Dion Cassius, Florus, Appian, and Justin), occupied the site of modern Lesina. The neo-Pharos, the *νέος Φάρος* of Scylax (??); the Ager Colonius of the Romans; the Oppidum Pharia of Pliny (iii. 26); and the Pharia city of Ptolemy (*loc. cit.*),\* which

\* Consult the "*Faria*," &c., of Ljubić (pp. 25–28), for proofs of the Roman epoch between B.C. 219 and A.D. 639.

lasted till the end of the 5th or the early 6th century, when the Slavs found it in ruins, was built where Cittavecchia now stands. On the other side, the doughty abbé, Dr. Simeone Ljubić (Gliubich), at present professor in the I. R. Gymnasium, and Curator of the Museum of Agram ("Faria Città Vecchia e non Lesina," Zagabria. Carlo Albrecht, 1873, an octavo of 68 pages, printed with the aid of the municipality of his native town), sounds no uncertain note. The following is the merest outline of his arguments (pp. 7, 8) in favour of Cittavecchia; of course most of the statements are traversed by Prof. Boglić. The latter localises near Lesina town the attack of L. Emilius Paulus, who razed the city which the Parians built in B.C. 385. He mentions (p. 15) an ancient mosaic two feet below the surface of the Bishop's garden in modern Lesina; another near the Mandracchio, or dock port; a fragment of granite column about two inches long; a pair of the sepulchral lamps called by the Italians "lume eterno"; and a multitude of coins, especially twenty-two of Ballæus, found in late years on the slopes crowned by the Forte Spagnuolo.

a. The existence of the old walls of Cittavecchia resembling the Palæokastra of Albania, &c., &c.

b. The many Greek inscriptions bearing the initials or the words *Φάριοι* and *Φαρίων*, and showing the old democratic republic to have been governed by Archontes, Prytaneis with their *Πρυτανείων*; a Senate (*Βουλῇ*) and a Scribe (*γραμματεῖος*) in the public *Ærarium* (*ἐν τῷ δημοσίῳ*). Another inscription, "di argomento inverecondo," is a Psephisma, or decree regulating the public prostitution which seems to haunt every port.

c. The multitude of Pharian coins inscribed *ΦΑ*, *ΦΑΡ*, and *ΦΑΡΙΩΝ*, and bearing the name of Ballæus (*ΒΑΛΛΑΑ*, *ΒΑΛΛΑΑΙ*, *ΒΑΛΛΑΙΟΥ*, and *ΒΑΛΛΑΥΟΥ* (?)), at first Archon, and lastly tyrant (*Βασιλεὺς*) \* of his native Pharos.

d. The number of other classical coins which have come to light.

e. The incised gems and cameos.

f. The sarcophagi "of primitive or Greek style, almost invariably anepigraphic," containing mortuary objects. One of these, discovered in 1869, when prolonging the riva southwards, yielded a gold ring with incised stone, and an exquisitely made chain of the same metal; both are now in the Museo del Tri-regno of Agram. "Some of the mortuary urns much resemble in shape those of Issa, which are undoubtedly in the Liburnian style."

\* Prof. Ljubić (p. 9) gives *Βασιλειος*, but as there is no accent, the omission may be a misprint. He is also the authority for the form *ΒΑΛΛΑΥΟΥ* (p. 9). Prof. Boglić says that the coins bearing *ΒΑΣΙΛΑ* are very rare (p. 18).

g. The marble bas-reliefs and similar objects, the three principal being—1. A mortuary genius, with reversed torch in the right hand, and in the left a bunch of grapes; it is a coarse production, placed on a pedestal of cut stone at the corner of the little square fronting the parochial church. 2. A Milo of Crotona, in mezzo rilievo. 3. A marble slab, showing an archaic Grecian galley, steered by a pilot. The last is high up in the Campanile; it is noticed by Fortis (ii. 175, Fr. ii. 238) as “un bassorilievo sufficientemente ben conservato in marmo Greco, che rappresenta una barca a vela, col timone alla destra della poppa, ed il piloto che lo governa.”

On the other hand Lesina, says the Abate (p. 11), shows no signs of those “primitive (Pelasgo-Illyrian?), Greek and Roman monuments. The town (whose origin is lost in the glooms of the middle ages) is stuck against a nude and savage rock; it has no *agro* (open ground) even to the south, and the few yards of dry surface forming the actual square, and bearing, amongst other edifices, the Duomo and the Episcopal Palace, were covered by the sea within the memory of man; in ancient times they must have been deep water,” &c., &c. Finally, the erudite professor quotes a host of authorities, who reject Lesina and support Cittavecchia.

He has, however, omitted to notice that the position of Cittavecchia is exactly that of ancient Salona—a recess, a sinus opening westward with higher ground to the north and south, thus defending it from the Bora, as well as from the Sirocco. Lesina, seated like Spalato, on the very edge of the mainland, faces the south with a much greater amount of exposure.

All the Cittavecchiani declared, to my unpleasant surprise, that they had never heard of “Cyclopean stones” at Gelsa. I determined, however, to judge for myself, and, kindly guided by the Deputato di Sanità, Sig. Gio. Actinovich, I set out to cross the island. The distance from Cittavecchia to Gelsa measures upon the map 4,000 Viennese klafters (= 8296.82 English yards, = 4.714 statute miles). Under the justum et per mundum approbatum regimen of the Serenissima Republica, to which Lesina was yielded in A.D. 1420 by its last Count, Aliota Capenna,\* this highway was a good *calçada* of cut stone and lime; now it resembles nothing more than a torrent bed, except during heavy rains, when it becomes a shallow torrent, a

\* According to Prof. Boglić (p. 50), Petrana, the Venetian Count of Zara, compelled Lesina to undergo the yoke about A.D. 1144. There was a second rendition in A.D. 1278 (p. 73); the final subjection after the last sway of the Hungarian sceptre was in A.D. 1420 (p. 103). The three commissioners who acted in the name of the Reggenza (count and judges); the nobility and the university (popular assembly), were Giovanni Ozor (de Ozoris), Vital di Silvestro, and Vito di Tomaso (Jan. 3, 1421).

fiumara, or, in local dialect, a "potok." It is everywhere enclosed, first by tall masonry, and afterwards by dry walls.

The almost level surface of the ground, a shallow prism, with highlands to the right and left, would represent the old Pharian *ager*. Its clothing of rich, ruddy clay, the produce of degraded chalk and ferruginous lime, is scattered with water-rolled bits of "breccia corallata," from the summits of the southern range. Fortis supports that this material is the "Tragurian marble," so highly prized by the Romans—angular fragments of white calcaire encrusted in a cement of petrified ochraceous earth, susceptible of a high polish, and often confounded with the African. He never found amygdaloid, nor pudding-stone, but always large, flat, angular, and irregular pieces, interrupting the continuity of the texture. These breccias, being frequently met with *in situ*, upon the summits of the Dalmatian ranges, confirm him in the belief that the islands were once part of the continent. I remarked that in some cases the white marmorine limestones set in the blood-red paste were rounded like true conglomerates, and I heard of a vinous coloured rock, probably the "Rosso da Cattaro" of Venice, which may be seen in the pavements of streets and churches at the place which gives it a name.

The route became more sandy as we approached Gelsa. The ground on both sides, broken into hill and dale, was enlivened by white-churched settlements, which are rather miniature cities than villages, and nowhere in Dalmatia had I seen dimensions so considerable. Thus we read in 1798 ("Engel, Geschich. v. Dalm. Allgem. Welthist." Halle, xlix. 228), "Verschiedene Dörfer derselben (Lesina) verdienen dem Namen von grossen Flecken, und sind stärker bewohnt als viele kleine Städte." The phenomenon is doubtless due to the comparative wealth and abundance of the island, which bears besides wine and oil, figs and almonds, saffron and honey. The *rakia* (*raki* of the nearer East) is particularly good and plentiful; the aloe flowers as in Greece, and at Lesina the fibre is made into fancy articles, purses, and nettings. Although the woods have been unwisely thinned, and re-forestation is requisite, palms and carobs, oranges and mulberries everywhere thrive. Sheep-wool and cheeses have taken the place of the salterns which, in 1772, formed the chief local industry, and the habit of long voyages has not abolished the fishery of anchovies, mackerel, and sardines, with which Lesina, in the days of Bosching, supplied Italy, and even Greece.\*

\* In 1861 a certain Sig. Carlo Warhenek began to cure sardines in oil at Fiume, and presently transferred his establishment to Gelsa, the centre of the Dalmatian sardine-fishery. But the want of transport and the excessive taxes on

On the right I remarked the settlements of Dol, Sfirze (Svirze? in Ital. "Sfirce"),\* and Verbanj, whilst to the left rose the fine large houses with which the little port of Verboska was adorned some three centuries ago. Half-way we passed a dilapidated little chapel, which my good guide called S. Cosmo, and which appears as S. Vito in the official map of the Austrian Empire (Special-Karte des Königreiches Dalmatien, &c., &c., von dem K. K. Militärisch-Geographischen Institute in Wien, 1861—1863). Beyond Verbanj we fell into the valley of the "Potok," as the streamlet of Gelsa is generically termed, and crossing a big stone bridge, we presently found ourselves in the little town. Here we were met by the Podestà, Capitano Nicolò Dubrovich, for whom I bore a letter from the friendly Prof. Glavinić. He led me to his house, introduced me to his family, and made me feel thoroughly at home. Most of the mayors in the Dalmatian Archipelago are retired *Capitaines de long cours*, substantial men with large estates, who, during their voyages, have accumulated not only capital, but a large stock of refinement and general information. In this point insular Dalmatia much resembles Switzerland.

Gelsa, in the official map Gjelsa, and by the Slavs called Jelsa, is often mentioned in local history. It appears to have been an ancient city, whose name is now lost. The Statuto di Lesina, compiled in A.D. 1331,† as the preface says, by a Russian lawyer, whom lung-disease drove to Venice, thus speaks of the ruins in A.D. 1407, *Civitas Vetus (Gradina) in Jelsa* (p. 202); and in 1425 we read (p. 217) "*inter civitatem Jelsæ . . . prope civitatem veterem in Jelsa.*" As will be seen, it was presently distinguished from the other *Civitas Vetus* (Cittavecchia) by taking the name of its fine fountain. Also Rafaele Luacovich (in Farlati Ill. Sacr. i. 197) says, "*Pagos habet (the island) civitatibus haud absimiles; Gelsam fontibus perennibus divitem. Verboskam ubertate agri pinguem,*" &c., &c.

The townlet occupies the head of a bight opening to the north-east, crossed by a masonry dam, and made tolerably safe for shipping by two short moles on the north and south sides. A few good houses, amongst which is the Podestà's, prefer the northern shore; the mass of the settlement lies opposite. It evidently owes its origin, as well as its name, to a perennial spring of the purest water, which wells up near the piazza.

oil compelled him to remove the "Fabbrica di conserve" to Barcola (S. Bartolo), in the Bay of Trieste.

\* All the names of towns (except Cittavecchia), hills, and dales are purely Slav. The orthography would be Vrbanj and Vrboska.

† Of this Liber Statutorum Communitatis Phæræ, afterwards printed under the name "Statuta Communitatis Lesinæ," Venetiis, 1643, see Boglić (pp. 112-129).



The Statuto (pp. 50, 51) says, "usque ad fontem vocatum Jelsam, quæ est apud mare salsum." It has its "Parrochiale"—

Half church of God, half castle 'gainst the Moor;

and its cemetery around the deserted Augustine monastery. It wears a thriving look, and I heard with pleasure the sound of the bell which rang the boys to church. A wire connects it with Spalato, the *chef-lieu*; and, indeed, nowhere about the Mediterranean have I found this instrument of our later civilisation so generally used as in Dalmatia. The principal want here is communication; those who would embark must ride for half a day over the roughest path, spanning mountains and valleys, to Lesina town, the only station of the Austrian Lloyds.

In 1772 Fortis (ii. 178, 179; Fr. ii. 242) described Gelsa as "un grosso villaggio ben situato," well-peopled with citizens dressed à la Française, and boasting not a few good houses and villas. The port receives many perennial streams, and the hills, which slope gently to the sea, produce the finest marmarine breccias, which are used for coarse pavement, or are built up in pauper huts. Besides the "corallata" before mentioned, there is a stone with irregular stains of pavonine colour, taking a polish which equals that of the finest Roman conglomerates. Mgr. Blascovich, Bishop of Makarska, took from its quarries all the material for the columns of his new cathedral, and for the steps and pillars of his altars. Unhappily, the cutters will save time and trouble by contenting themselves with the upper strata; the softer portion, especially the natural cement, containing the marble, is thus degraded by the atmosphere, perhaps also by seawater, and it soon deteriorates when exposed to sun and rain. Fortis also remarked a black and white lumachella, composed of hardened bituminous earth, and orthoceratites, changed, as usual, into a sparry saline calcaire. He does not notice the ruins either at Cittavecchia or at Gelsa, for the good Abbé was a naturalist rather than an antiquary, and he seems somewhat sore about his reception. The fishermen were perhaps at sea, and "quando io giunsi colà non trovai quella cortesia, che suole abitare colla povera gente." Thus his experience and mine differ *toto cælo*.

Tuesday (December 29th) appeared in its very ugliest guise. The climate of fair Dalmatia can, like certain Madonna-faced beauties, show an amount of ill-temper as serious as it is startling. I rose in the dark, hardly hoping to see my host, but he was no "marinero di acqua dolce," justifying the old saw,

Di sera leone,  
Di mattina babbione;

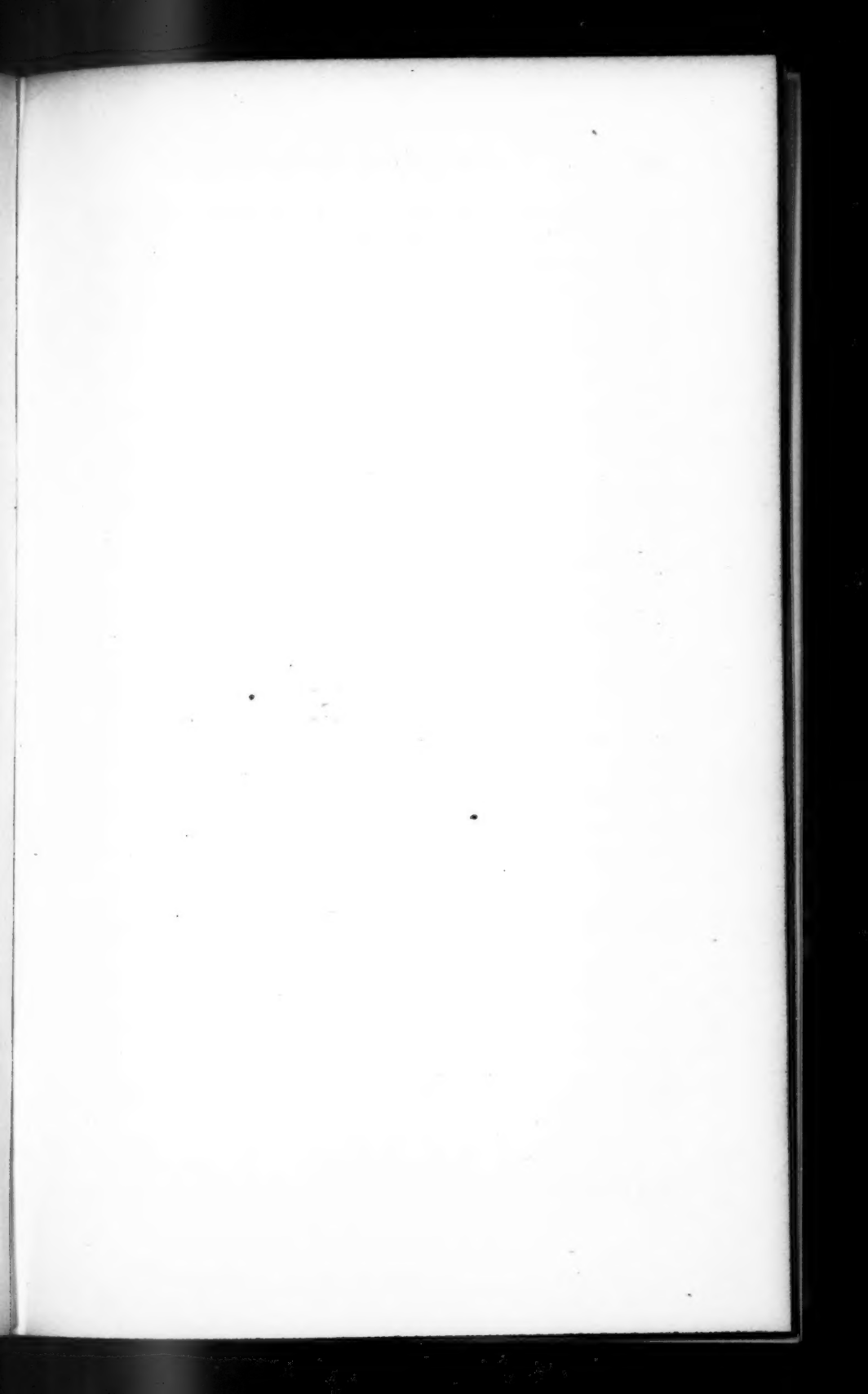
and he cared not a jot for the frenzied gusts, the Scotch mists,

and the showers which fell as if buckets were being emptied upon the hills—in these latitudes, when it rains it *does* rain. During the evening we had learned that two ruins were to be visited, the “Grad” and the “Tor,” the former bearing from his house, “Ostro quarta e mezza Sirocco” (S. by E.  $\frac{1}{4}$  E.), and the latter “Ostro e tre quartini Levante” (S.  $\frac{3}{4}$  E.). The time would take an “oretta”—beware of the “little hour” in Dalmatia and Istria. On this occasion, however, it was only double.

Passing through the townlet, we began the ascent of the low and ruddy outliers of the Gvezdjena Gora (Gvezd Berg of the map), or Iron Mountain, a long range running nearly upon a parallel of latitude. The reason of the metallic name is unknown; perhaps it is derived from the steel-grey spines, bands, and cornices of the hardest limestone, which accident the slopes. Beyond the Madonna della Salute the goat-path became stiff and stony, slippery withal under mud and rain.

On these islands the traveller in search of prehistoric remains becomes, after a fashion, an explorer. He must visit everything that bears the name of “grad,” or its multiform derivations,\* and, as in Africa, he must labour to ascertain what there is not, as well as what there is—*ea quæ sunt, tanquam ea quæ non sunt*. After breasting the iron height, we reached this particular “grad,” and the first glance told me that the masonry, which might have been Venetian, was more probably post-Venetian and Slav. The aneroid at 28·9, and at a sea-level, 29·9, showed an altitude of a thousand feet, and the site was that of an Etruscan city, a “Mull,” the Icelandic “Múli,” or loop of high ground, with a declivity more or less precipitous on all sides but one—here the western. The rock fell sheer to the south; the neck had been fortified, but the outworks were so ruinous that their form could hardly be ascertained. The enceinte followed the contour of the ground; in places it was based upon the limestone, at this and in other parts forming parallelipedons by stratification and cleavage, which easily suggested the “Cyclopean wall.” Here and there it is difficult to distinguish the natural from the artificial, so exactly do the joints correspond. Fortis remarks the same of the sandstone, and he figures (Table xii. vol. ii. 100) the natural wall (“filoni simili a muraglie”) of Rogosnizza. In Istria I should have thought that the origin of this “grad” might have been one of the so-called Castellieri. A dilapidated cistern-shaped affair, showing the spring of the arched roof, and facing southwards with westing, is, according

\* The curious reader will consult the paper on the “Castellieri of Istria,” which it was my evil fate to publish with the Anthropological Society of London (“*Anthropologia*,” No. iii. Oct. 1874).



# ELEVATION OF THE "TOR."

*Shows the draught and boss at North corner.*

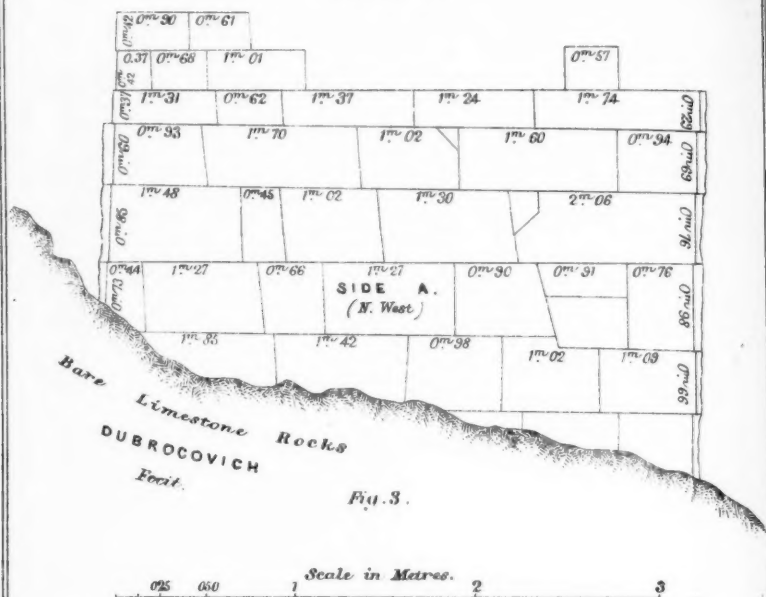
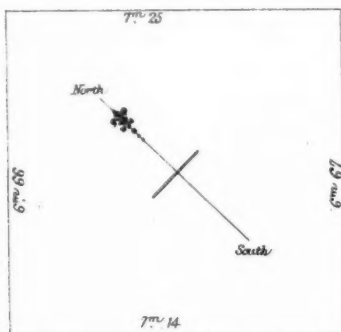


Fig. 2.  
DALMATIAN FIND.



*Axe of fine Greenstone found at Salona near Spalato. Apparently broken about half way.*



GROUND PLAN OF TOR DI GELSA.  
SIDE A.

Fig. 4.

Fig. 1.  
DALMATIAN FIND.



*One of the two Silurian implements in the Museum of Spalato. The first found in Dalmatia. Flake of clay colored. Flint edges jagged, possibly used for lighting pipes found close to the frontier of Bosnia.*

to the legend, the burial-place of its "king," Subich (Subij). All traces of the tomb have lately disappeared.

Professor Boglić tells us (pp. 126, 127) that this "Grad Galic-nik" is described by the monk Priboevo, of Lesina, and quotes as follows from a manuscript letter addressed to H. E. Gio. Bragadin in A.D. 1723: "Sulla di lui sommità (the mountain near Gelsa) v'è un recinto di mura, da Oriente (poggia) sull'orlo di sasso dirupato. L'opera è in quadro, lunga 30 e più brazza (a minimum of 21·83 yards); larga nell'ingresso brazza dodici (8·73 yards); in fondo brazza otto (5·82 yards) incirca. Si vedono nel di lui mezzo due casette, una diroccata ma angusta; l'altra a volta di pietra, bastante a ricettare sotto il tetto la statura del più alto homo, ma capace di poche persone. . . . Intorno nelle mura interiormente si distinguono continuati buchi di travi (the modern buchi per i falconi, dowel-holes to receive the ends of floor-joints) di mezzo carro in linea uguale. Danno a credere si sia stato un tavolato intorno per gente, che coperta da merli delle mura possa tutelare il recinto. . . . Questo luogo vien chiamato Galicinich. Corre un idiotismo (trivial legend), che due regoli fossero patroni, di Gradina, che nell'idioma illirico suona città diroccata, e di Galicinich; tra loro inimici, et in continua guerra; e vi fu chi in Galicinich egualmente credulo ad avaro sudasse per trovare tesoro nascosto."

Somewhat despairing about the other building, I walked across the slope of the Iron Mountain, about three-quarters of a mile to the west, by a path rounding the heads of two small ravines. At one sheltered spot appeared a newly-planted vineyard: in Dalmatia, as in Istria, cultivation rises high above sea-level.

Presently we came upon the Torre di Gelsa; the Slavs call it "Tor," or sheep-fold (*e.g.* ú-Tor, nell'ovile), but perhaps the latter is a mere corruption of the former. I was delighted; my rough and rainy walks had not been in vain. The site is singular; the apex of a rocky arête, utterly without water, except from rain, and apparently isolated, although large cut-stones, which may have belonged to it or to its outworks, were scattered around. The inside was filled up with earth; externally it showed from four to five isodomic lower courses of large ashlar, calcaire from the mountain on which it stood, and nowhere was there a trace of mortar. The largest parallelopipedon measured 2·06 metres (=6 feet 9 inches) by 0·76 (=2 feet ·59 inches) in height. The angles, especially the north-eastern, showed the draught extending through the courses from the lowest to the highest. The western exterior consisted of four lower courses of large stones, capped by three modern, or, at least, smaller layers; and the emplectori, or "old English bond," popularly called "headers and stretchers," were apparently not unknown to the



builders. The stones were all boldly bossed, like those of Salona, with chiselled draughts, and the height of the projection might have been 6 to 8 inches. The magnetic meridian passed through the angles, and the slope was an oblong rather than a square. The northern side measured 7·25 metres (=23 feet 9 inches); the southern 7·14; the eastern and the western 6·66 (21 feet 10 inches).

My sketch was utterly spoilt by the deluging rain at the time of inspection; the *nebulæ malusque Jupiter* determined to do their very worst. But my excellent host promised to send me plan, elevation, and measurements. He kept his word with truly British punctuality, and enabled me to present to my readers the sketch which accompanies these pages (Pl. xiii. figs. 3, 4). I gladly take the earliest opportunity of thanking him once more.

Professional archaeologists will determine the *rapport* between this mysterious building and the Pantellarian "Sesi," which have yielded stone implements; the Nuraghi of Sardinia and the Balearic Talajot (Arab. تالوت, *i.e.* watch-towers). The general aspect reminded me of the garrison-stations on the Roman high-roads, especially of that near Khan Khuldeh, supposed to be the "Mutatio Heldua" of the Jerusalem Itinerary, near Bayrūt, on the way to Sidon. But here there is no sign of cement. I found no traces of a highway, and the site, commanded on the southern side, and occupying the roughest of rocky ground, where enemies might everywhere lie in ambush, and where half a dozen square yards of tolerably level surface cannot be had, renders it equally unfit for a refuge place and for a settlement. It might perhaps be an outwork and a look-out commanding the sea; still there remains the curious contrast of elaborate finish with an object for which the simplest building would suffice.

Prof. Boglić appears to think (pp. 11-12) that the "Tor" was connected with certain ruins near the Gelsa townlet, which have disappeared only lately, either buried under alluvium or removed by the peasantry. He quotes Priboevo of Lesina, who, in a discourse or harangue (*De Origine et Successibus Slavorum*) pronounced (1525) before an "Academy" in his native town, describes in these words the ruins of Cittavecchia and Gelsa. I preserve the quaint contractions of the original.

"Quapp. neminē capiat admiratio, duas olim, altera ab oriente, altera ab occidente, cui' supra memin' egregios sortita port', hoc ī agro urbis extitisse, ipsā ruina pristinā ear. dignitatē prodente, apparentibus ibidem pluribus magnis ædificiis, et ex pario lapide truncatis, et semicorrosis Heroum imaginib', nec non et lithostratis varias bestiar' et sydir' formas præferentibus. . . . Est et unum adhuc fere integrum inter montis oppidum urbi (*i.e.* Gelsæ) quæ orientalem agri hui' regionem obtinebat

supereminens, juxta quod ad jactum sagittæ, ex quadratis miræ magnitudinis lapidibus turris est, unicum habens angustum hostium, in qua ob antiquitatem nullum cementi vestigium apparet. Sunt et in plerisq. aliis hujus insulæ locis, humanæ habitationis vestigia, in quib' antiqui illi Pharenses vicatim habitaverunt. Ex his colligo pter primariâ in qua sum' urbem, quæ a meridionali insulæ parte posita, Pharum propie, vulgo autem (sicut Calepinus prodit) Lisna, corrupti' aut Lesina dicitur, sex in hac insula olim oppida absque villis, quæ numerosæ erant, extetissi" (sic).

Prof. Boglić (pp. 11, 12) thus describes the building:—"Anche una torre, che sorge da un cumulo di sassi sul monte posto a mezzogiorno di Jelsa, offre tutti i caratteri dei ruderi di Cittavecchia, soltanto i massi sono battuti più rozzamente, ed il lavoro potrebbe credersi più antico. Alcuni di questi sono alti due piedi ed otto polci Viennesi (= 2 feet 9.10 inches); lunghi cinque (= 5 ft. 2.23). Ai tempi del Priboevo nel lato di mezzodi vi era una porticina, che poscia ruinò, e non restano che soli tre lati, che varebbe la pena di meglio conservare. I pastori ne distrussero una parte, atterrando poco a poco le pietre, che sovrapposte le une alle altre senza cemento, più facilmente si potevano smuovere. I lati della torre che ancora restano, sono alti sedici piedi Viennesi circa (= 16 feet 7.12 inches); lunghi a Settentrione ventidue (= 22 ft. 9.79) diciannove (= 19 ft. 8.46) ad Occidente e Levante."

Professor Boglić wisely refuses to "evocate" the Pelasgi, because similar monuments are found in Eastern Asia, for instance, where those wandering tribes cannot, "even with the greatest indulgence," be made to emigrate. I would here remark that the Samothracian Pelasgi seem of late years to have gone out of fashion, probably on account of the highly absurd etymologies proposed for them, such as Semitic roots for an Aryan race;\* and yet there is no race of which the universal voice of classical antiquity speaks with more clearness and consent. The professor holds that the Gelsa style of architecture was not peculiar to a single people, but rather that it denotes a certain stage of civilisation, of progress, evolved under ethnological conditions the most dissimilar. A nation which either cannot, or which knows not how to make the cement that con-

\* For instance, Pelishti or Felishti, peregrinus, advena, from Palasha (Falasha) migravit, whence, by-the-by, the Falasha Jews of Abyssinia. Some explain the Semitism by supposing that it was applied to the Indo-Europeans by the Egypto-Phenicians; if so, had they no racial name of their own? Also from Pelasgus, the king who civilised them. From Pelargos, a crane (quod gregatim errarent); from Palæos, ancient; from Pélagus, the sea, being a maritime race; from the root of "pellere" and ex-pel. Chabas ("Études sur l'antiquité," &c., August, 1872) thinks that he finds them in the Pelestatas of the Stela of Medinat Habu, recounting the conquests of Rameses, and dating from the 12th century B.C.

solidates small stones into a mass of masonry, must perforce, when building its defences, employ megaliths whose weight keeps them in place, even when exposed to the shock of battering engines. He finds this specially denoting, in Greece as well as in Italy, the epoch of incipient settled life, the first stage of civilisation. He therefore concludes that the ruins of Cittavecchia, and of the Tor di Gelsa, were the works of the later Illyrians.\* These tribes were found occupying Lesina in the 4th century B.C., and in B.C. 45, according to Diodorus Siculus (xiii. 3), they inhabited "a little settlement of extraordinary strength (*ἐν τινι κωρίῳ καθ' ὑπερβολὴν ὄχυρῳ*).

I must here join issue with the learned professor upon sundry points. Diodorus Siculus (xiii. 3) speaks distinctly of the founding (*κτίσις*) and walling of Pharia by the Parians. The walls of Cittavecchia certainly belonged to a Greek colony, as is proved by the thousand remains found within them, to say nothing of their shape, and the form which they enclosed. The Tor di Gelsa does not appear to me a ruder or a more primitive form than the defences of Pharia, although having been exposed for long ages to the violent Bora, it has been more mutilated by time and weather. And I can hardly imagine how he made away with the fourth side; it reminds me of what was said of Ireland, where—

The sly surveyors stole a shire.

Finally, the remarkable resemblance, amounting almost to identity of shape, between the two Lesina ruins and those of the "Murazzo," or long wall of Salona, the subject to which the first part of this paper was devoted, naturally suggests that all three were the work of a single people, and that people not the barbarous Illyrians, but the comparatively civilised Greeks.

A few words to the reader by way of conclusion. The late Mr. Paton, whose acquaintance I had made, and whose memory I would treat as that of a friend, wrote a useful and not unlearned book, which he called by the picturesque name, "Highlands and Islands of Dalmatia." I should be sorry if it induced the archaeologist to imagine for a moment that exploration of either feature had ever even been attempted. Whilst Greek and Roman antiquities have occupied the lives of many able men, prehistoric study is only now making itself known by name. The best proof is that at the end of 1874 only two stone implements, both found within the year, had taken their place in the little museum of progressive Spalato (Pl. xiii. figs. 1, 2).

\* Prof. Boglió (pp. 9, 10) adopts the opinion of Niebuhr, that—(1) the Illyrians were a different race from the Liburnians; and that (2) the Illyrians, from whom the Skipitar (Albanians) are descended, inhabited with the Greeks the Peonians, and the Thracians, "Pelagias," or Macedonia; but they were neither Greeks nor Pelasgi.

I need not speak of the Dalmatian highlands; but to explore the islands there is some little difficulty. The traveller will find scanty aid from steamers; he will have no roads, and he must work his way on foot through the roughest bush; he must carefully visit every height; and he must be prepared for few successes and many failures. If he cannot speak Slav, he must be accompanied by one who does, and he had better take with him plain and coloured engravings of stone implements, which will supply the want of technical language; for instance, an arrow-head or axe will be known only as *Mali kamen strella*, the little lightning-stone. He must be prepared to rough it, to live hard, not to murmur against the smaller insects, and, perhaps, to risk an attack of ague and fever. Finally, though life is not expensive, he must prepare for a considerable waste of precious time.

I had preserved, so to speak, the Dalmatian Islands as a happy hunting-ground; but official occupations, and, worse still, a serious illness, interfered with my projects. Next to exploring for oneself, the best work an explorer can do is to promote exploration in others. My highest ambition for these pages is to show how much remains to be done. A party of three or four friends, forming a committee of discovery, could hardly spend their time better than by devoting the best season of the year, from April to June included, to a careful survey of the Dalmatian Archipelago, visiting every site called *Grad*, and collecting the folk-lore which everywhere abounds. I prefer the number four, because it would obviate the delay by enabling the party to separate into two and three sections. Needless to say that all my small amount of experience would be gladly placed at the adventurers' disposal, and that they would have my best wishes for their success.

#### EXPLANATION OF PLATES XII. AND XIII.

Plate xii.—Plan of Salona, near Spalato, showing the Long Wall; with plan of the Amphitheatre and Cæsarian Gate.

Plate xiii.—Fig. 1. The first stone implement found in Dalmatia, now in the Museum of Spalato. Half natural size. Fig. 2. Axe of greenstone, found at Salona. Half natural size. Fig. 3. Elevation of the Tor di Gelsa, in the Island of Lesina. Fig. 4. Plan of the Tor di Gelsa.

#### DISCUSSION.

MR. HYDE CLARKE said that Captain Burton's paper was of the greater interest, as he had observed that in Istria and Dalmatia the ancient names were largely pre-Hellenic, and conformed to those in Etruria, Hellas, Asia Minor, and generally to the Sumerian class.

Prof. HUGHES said that Captain Burton had brought before them the results of his observations on three quite unconnected remains in different parts of the country. 1st, there were the neolithic remains on the island; 2nd, the ancient camp; and 3rd, the old walls. With regard to Captain Burton's remarks on the first, he thought that, whatever reason there might be for supposing that great changes had taken place in the physical geography of the Mediterranean area since the diminutive Maltese elephant and its contemporaries had walked from Africa to Malta and Europe, or that Palæolithic man had looked on a shore very different from what we see there now, still we have no evidence that would justify our assuming that the Adriatic islands had been cut off from the mainland since neolithic times, even though we know that along the lines of volcanic activity considerable changes of level have taken place in historic times. With regard to the second set of phenomena, it was interesting to find that in that part of Europe, as in Britain, the races which immediately preceded historic times built the same kind of camp, occupying a hill-top and throwing up irregular lines where necessary, and where the position could be most easily defended, but which had no constant size or form. Pottery, however, he thought, was an uncertain test of age when applied to the correlation of remains found in districts far apart and countries imperfectly worked out. For instance, he had seen pottery being manufactured on the northern spurs of the Pyrenees which differed in no respect from that found in caves with the remains of primæval man in the same district. He objected to Captain Burton's definition of Cyclopean and Pelasgic, pointing out that the term Pelasgic had got into disrepute among ethnologists because, if applied to everything pre-Hellenic, it was too vague for their purpose, and when limited, the limitations had been generally founded upon unwarrantable assumptions. Cyclopean was used for those ancient walls, built of stones so enormous that fancy called up giants for their construction. But there was not sufficient evidence to fix the relative age of Pelasgic and Cyclopean, or to justify such a new application of old words as that suggested.

Mr. MOGGRIDGE suggested whether the object of which a model was exhibited may not have been a Muller. It closely resembles a Muller which he found in disinterring one of the most ancient churches in this island, that had long been hidden from the eye of man; so long, indeed, that when he went to work the only clue he had was that tradition said, "under that sand-hill lies the ancient church." If this be a Muller, it may indicate the nationality of those who at one time occupied the spot on which it was found.

The PRESIDENT remarked that as Captain Burton had alluded to the resemblance between the Castellieri he had spoken of and some of the hill forts, described by him (the President), in the "*Archæologia*," it might be useful to say a few words on that point. It was certainly remarkable, but by no means surprising, that such a resemblance should exist, the chief feature of which appeared to him to consist in the fact of their being situated on the tops of hills,



remote from water, security against attack being the main object sought, and implying a condition of constant warfare between tribe and tribe. A thickly overgrown, marshy, and unhealthy lowland country would also have this result. Whereas, in times corresponding to the Roman era, the encampments and other habitations were often situated in low ground, and generally near water, showing that in a higher condition of culture the interior economy, comfort, and convenience of the inhabitants were beginning to be better looked after. The casts of spear-heads exhibited by Captain Burton, the originals of which are said to be of copper, are of the kind more usually constructed of bronze, and are of what may be called the northern type; that is to say, they are leaf-shaped, with a medial rib, and provided with sockets, the whole of which is cast; corresponding in all respects to those found in England, Denmark, France, Germany, and eastward as far as Siberia, and differing essentially from those found in the island of Cyprus, from those discovered on the site of Troy by Dr. Schlieman, from some of those used in ancient Egypt, and from those found in Hindustan, in which the spear-heads are either fitted into the shafts by means of tangs on the sockets, or formed by being cast flat, and afterwards bent over the head of the shaft, leaving a longitudinal slit at the point of junction. This is a noteworthy distinction between the implements of the two regions. The fragments of pottery exhibited appear to be of at least two kinds; a fine description, corresponding to what we should in this country call Roman; and a somewhat coarser kind, containing grains of quartz, resembling what we might here term Romano-British; but there is none of the looser, ill-baked kind, which is characteristic of early British pottery. Captain Burton had been so kind as to make him a present of these casts for his collection at Bethnal Green, and he need hardly say that he regarded them as of the highest value and interest.

The author briefly replied.

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Mr. Rudler read a communication from Mr. HORACE B. WOODWARD, describing a wooden image and a spear-head discovered near Newton Abbot. They were found by workmen in the employ of Messrs Watts, Blake, Bearne, and Co., clay merchants, of Newton Abbot, by which firm they were exhibited.

In digging for the pipe and potters' clay belonging to the Bovey formation, and which occupies the greater part of the valley between Bovey Tracey and Newton Abbot, there is always met with a superficial accumulation of gravel, sand, and mud, called the "Head" (and sometimes "Pengelly's Head"). This gravelly deposit has no connection with the Bovey deposit, being comparatively of very recent date; nevertheless, when looked at in a large way, and traced on the ground, it is found to extend up the hill-sides at Woolborough and Milber Down, to a height of 330 and 420 feet, and, indeed, in one place, to

a height of 540 feet. At the same time, the gravel extends towards Chudleigh, and occurs in outlying masses, which seem to connect it with the drifts on Haldon Hills, 800 feet and more above sea-level. It is necessary to mention these facts, because the valley of the Teign, near Newton, has received deposits of drift gravel which cannot be satisfactorily attributed to present river action, and may, perhaps, be connected with the phenomena of the glacial period.

Be this as it may, there is no doubt that some of the gravels in the lower parts of the valley have been re-assorted by the present river; so that, although it may be difficult, and, in some instances, impossible, from superficial observation, to separate the gravels into those of most recent date and those of possibly glacial age, yet we must be prepared to assign a very recent origin to many of the gravels in the low grounds, and to account for rapid accumulation of gravel by the fact that it was there "ready-made," and had only to be re-assorted and re-deposited by the action of the present river, aided as well by the deposits brought down from the hills by the main stream and its tributaries, as by mud that might be brought up by the incoming tide, for tidal conditions formerly prevailed much higher than at present.

The specimens were discovered in the gravel above the clay between Newton Abbot and Kingsteignton, in a large pit by the river-side on its left bank, about a quarter of a mile north-west of the turnpike. The clay pit is called Zitherixton Pit, and is partly in the parish of Teigngrace and partly in that of Kingsteignton.

The section displayed a thickness of 25 feet of gravel, sand, and mud stratified, but varying much in detail at different parts of the pit. Towards the top the gravel was generally fine, and at the base usually very coarse. Many fragments of oak trees were met with—the heads pointing down-stream—and against them gravel was banked on the higher ends (up-stream), while mud was accumulated on the lower end. The oaken figure was found standing in a nearly upright position against one of these trees, embedded in gravel, and at a depth of 20 feet. The bronze spear-head was found at a depth of 15 feet, and numerous bones of ox, deer, &c., were met with at a depth of from 15 to 20 feet.

The image and spear-head have since been described and figured by Mr. Pengelly in the "*Transactions of the Devonshire Association*," vii. p. 200, and plate.

The level of this deposit was but 4 or 5 feet above the river-level, so that the pit was worked to some considerable extent below the water-level, and much subject to infiltration of the water. The deposit may, without doubt, be classed amongst the latest accumulations of the river, and be included with the alluvium.

JUNE 22ND, 1875.

Colonel A. LANE FOX, *President, in the Chair.*

The minutes of the previous meeting were confirmed.

FREDERIC CLAUDET, Esq., F.C.S., of 10, Oak Hill, Hampstead, was elected a member.

The following list of presents was read, and thanks were voted to the donors:—

FOR THE LIBRARY.

From the SOCIETY.—Proceedings of the Royal Geographical Society. Vol. XIX. No. 5.

From the AUTHOR.—Nirragghi Sardi and other Non-Historic Stone Structures. By Captain S. P. Oliver.

From the ANTHROPOLOGICAL SOCIETY OF SPAIN.—Revista de Antropologia.

From Captain HAROLD DILLON.—Report of Surveyor-General of Dominion Lands, December, 1874.

From JAMES BURNS, Esq.—Human Nature, for June, 1875.

From the SOCIETY.—Mittheilungen der Anthropologischen Gesellschaft in Wien.

From the ASSOCIATION.—Journal of the Royal Historical and Archaeological Association of Ireland.

From the EDITOR.—Revue Scientifique. Nos. 49, 50, and 51, 1875.

From the EDITOR.—Materiaux pour l'Histoire Primitive et Naturelle de l'Homme. Vol. VI. No. 6.

From Messrs. CHAPMAN AND HALL.—Wanderings in New Guinea. By Captain John A. Lawson.

From the EDITOR.—Nature, to date.

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In the absence of the author, the following paper was read by Mr. Rudler:—

*The COMPARATIVE PSYCHOLOGY of MAN.* By HERBERT SPENCER.

WHILE discussing with two members of the Anthropological Institute the work to be undertaken by its psychological section, I made certain suggestions which they requested me to put in writing. When reminded, some months after, of the promise I had made to do this, I failed to recall the particular suggestions referred to; but in the endeavour to remember them, I was led to glance over the whole subject of comparative human psychology. Hence resulted the following paper.

That making a general survey is useful as a preliminary to deliberate study, either of a whole or of any part, scarcely needs

showing. Vagueness of thought accompanies the wandering about in a region without known bounds or landmarks. Attention devoted to some portion of a subject, in ignorance of its connection with the rest, leads to untrue conceptions. The whole cannot be rightly conceived without some knowledge of the parts; and no part can be rightly conceived out of relation to the whole.

To map out the comparative psychology of man must also conduce to the more methodic carrying on of inquiries. In this, as in other things, division of labour will facilitate progress; and that there may be division of labour, the work itself must be systematically divided.

We may conveniently separate the entire subject into three main divisions, arranged in the order of increasing speciality.

The first division will treat of the degrees of mental evolution of different human types, generally considered: taking account of both the mass of mental manifestation and the complexity of mental manifestation. This division will include the relations of these characters to physical characters—the bodily mass and structure, and the cerebral mass and structure. It will also include inquiries concerning the time taken in completing mental evolution, and the time during which adult mental power lasts; as well as certain most general traits of mental action, such as the greater or less persistence of emotions and of intellectual processes. The connection between the general mental type and the general social type should also be here dealt with.

In the second division may be conveniently placed apart, inquiries concerning the relative mental natures of the sexes in each race. Under it will come such questions as these:—What differences of mental mass and mental complexity, if any, existing between males and females, are common to all races? Do such differences vary in degree, or in kind, or in both? Are there reasons for thinking that they are liable to change by increase or decrease? What relations do they bear in each case to the habits of life, the domestic arrangements, and the social arrangements? This division should also include in its scope the sentiments of the sexes towards one another, considered as varying quantitatively and qualitatively; as well as their respective sentiments towards offspring, similarly varying.

For the third division of inquiries may be reserved the more special mental traits distinguishing different types of men. One class of such specialities results from differences of proportion among faculties possessed in common; and another class results from the presence in some races of faculties that are

almost or quite absent from others. Each difference in each of these groups, when established by comparison, has to be studied in connection with the stage of mental evolution reached, and has to be studied in connection with the habits of life and the social development, regarding it as related to these both as cause and consequence.

Such being the outlines of these several divisions, let us now consider in detail the subdivisions contained within each.

I.—Under the head of general mental evolution we may begin with the trait of—

1. *Mental mass*.—Daily experiences show us that human beings differ in volume of mental manifestation. Some there are whose intelligence, high though it may be, produces little impression on those around; while there are some who, when uttering even commonplaces, do it so as to affect listeners in a disproportionate degree. Comparison of two such makes it manifest that, generally, the difference is due to the natural language of the emotions. Behind the intellectual quickness of the one there is not felt any power of character; while the other betrays a momentum capable of bearing down opposition—a potentiality of emotion that has something formidable about it. Obviously the varieties of mankind differ much in respect of this trait. Apart from kind of feeling, they are unlike in amount of feeling. The dominant races overrun the inferior races mainly in virtue of the greater quantity of energy in which this greater mental mass shows itself. Hence a series of inquiries, of which these are some:—(a) What is the relation between mental mass and bodily mass? Manifestly, the small races are deficient in it. But it also appears that races much upon a par in size—as, for instance, an Englishman and a Damara, differ considerably in mental mass. (b) What is its relation to mass of brain? and, bearing in mind the general law that in the same species, size of brain increases with size of body (though not in the same proportion), how far can we connect the extra mental mass of the higher races, with an extra mass of brain beyond that which is proper to their greater bodily mass? (c) What relation, if any, is there between mental mass and the physiological state expressed in vigour of circulation and richness of blood, as severally determined by mode of life and general nutrition? (d) What are the relations of this trait to the social state, as predatory or industrial, nomadic or agricultural?

2. *Mental complexity*.—How races differ in respect of the more or less involved structures of their minds, will best be understood on recalling that unlikeness between the juvenile mind



and the adult mind among ourselves, which so well typifies the unlikeness between the minds of savage and civilized. In the child we see absorption in special facts. Generalities even of a low order are scarcely recognized; and there is no recognition of high generalities. We see interest in individuals, in personal adventures, in domestic affairs; but no interest in political or social matters. We see vanity about clothes and small achievements; but little sense of justice: witness the forcible appropriation of one another's toys. While there have come into play many of the simpler mental powers, there has not yet been reached that complication of mind which results from the addition of powers evolved out of these simpler ones. Kindred differences of complexity exist between the minds of lower and higher races; and comparisons should be made to ascertain their kinds and amounts. Here, too, there may be a subdivision of the inquiries. (a) What is the relation between mental complexity and mental mass? Do not the two habitually vary together? (b) What is the relation to the social state, as more or less complex?—that is to say, Do not mental complexity and social complexity act and react on each other?

3. *Rate of mental development.*—In conformity with the biological law, that the higher the organisms the longer they take to evolve, members of the inferior human races may be expected to complete their mental evolution sooner than members of the superior races; and we have evidence that they do this. Travelers from all regions comment, now on the great precocity of children among savage and semi-civilized peoples, and now on the early arrest of their mental progress. Though we scarcely need more proofs that this general contrast exists, there remains to be asked the question, whether it is consistently maintained throughout all orders of races, from the lowest to the highest—whether, say, the Australian differs in this respect from the Hindu, as much as the Hindu does from the European. Of secondary inquiries coming under this sub-head may be named several. (a) Is this more rapid evolution and earlier arrest always unequally shown by the two sexes; or, in other words, are there in lower types proportional differences in rate and degree of development, such as higher types show us? (b) Is there in many cases, as there appears to be in some cases, a traceable relation between the period of arrest and the period of puberty? (c) Is mental decay earlier in proportion as mental evolution is rapid? (d) Can we in other respects assert that where the type is low, the entire cycle of mental changes between birth and death—ascending, uniform, descending—comes within a shorter interval?

4. *Relative plasticity.*—Is there any relation between the

degree of mental modifiability which remains in adult life, and the character of the mental evolution in respect of mass, complexity, and rapidity? The animal kingdom at large yields us reasons for associating an inferior and more rapidly-completed mental type, with a relatively automatic nature. Lowly organized creatures, guided almost entirely by reflex actions, are in but small degrees changeable by individual experiences. As the nervous structure complicates, its actions become less rigorously confined within pre-established limits; and as we approach the highest creatures, individual experiences take larger and larger shares in moulding the conduct: there is an increasing ability to take in new impressions and to profit by the acquisitions. Inferior and superior human races are contrasted in this respect. Many travellers comment on the unchangeable habits of savages. The semi-civilized nations of the East, past and present, were, or are, characterized by a greater rigidity of custom than characterizes the more civilized nations of the West. The histories of the most civilized nations show us that in their earlier times the modifiability of ideas and habits was less than it is at present. And if we contrast classes or individuals around us, we see that the most developed in mind are the most plastic. To inquiries respecting this trait of comparative plasticity, in its relations to precocity and early completion of mental development, may be fitly added inquiries respecting its relations to the social state, which it helps to determine, and which reacts upon it.

5. *Variability*.—To say of a mental nature that its actions are extremely inconstant, and at the same time to say that it is a relatively unchangeable nature, apparently implies a contradiction. When, however, the inconstancy is understood as referring to the manifestations which follow one another from minute to minute, and the unchangeableness to the average manifestations, extending over long periods, the apparent contradiction disappears; and it becomes comprehensible that the two traits may, and ordinarily do, co-exist. An infant, quickly weary with each kind of perception, wanting ever a new object, which it soon abandons for something else, and alternating a score times a day between smiles and tears, shows us a very small persistence in each kind of mental action: all its states, intellectual and emotional, are transient. Yet at the same time its mind cannot be easily changed in character. True, it changes spontaneously in due course; but it long remains incapable of receiving ideas or emotions beyond those of simple orders. The child exhibits less rapid variations, intellectual and emotional, while its educability is greater. Inferior human races show us this combination: great rigidity of general character with great irregularity in its passing manifestations. Speaking broadly,

while they resist permanent modification they lack intellectual persistence, and they lack emotional persistence. Of various low types we read that they cannot keep the attention fixed beyond a few minutes on anything requiring thought, even of a simple kind. Similarly with their feelings: these are less enduring than those of civilized men. There are, however, qualifications to be made in this statement; and comparisons are needed to ascertain how far these qualifications go. The savage shows great persistence in the action of the lower intellectual faculties. He is untiring in minute observation. He is untiring, also, in that kind of perceptive activity which accompanies the making of his weapons and ornaments: often persevering for immense periods in carving stones, &c. Emotionally, too, he shows persistence not only in the motives prompting these small industries, but also in certain of his passions—especially in that of revenge. Hence, in studying the degrees of mental variability shown us in the daily lives of the different races, we must ask how far variability characterizes the whole mind, and how far it holds only of parts of the mind.

6. *Impulsiveness*.—This trait is closely allied with the last: unenduring emotions are emotions which sway the conduct now this way and now that, without any consistency. The trait of impulsiveness may, however, be fitly dealt with separately, because it has other implications than mere lack of persistence. Comparisons of the lower human races with the higher, appear generally to show that, along with brevity of the passions, there goes violence. The sudden gusts of feeling which men of inferior types display, are excessive in degree as they are short in duration; and there is probably a connection between these two traits: intensity sooner producing exhaustion. Observing that the passions of childhood illustrate this connection, let us turn to certain interesting questions concerning the decrease of impulsiveness which accompanies advance in evolution. The nervous processes of an impulsive being, are less remote from reflex actions than are those of an unimpulsive being. In reflex actions we see a simple stimulus passing suddenly into movement: little or no control being exercised by other parts of the nervous system. As we ascend to higher actions, guided by more and more complicated combinations of stimuli, there is not the same instantaneous discharge in simple motions; but there is a comparatively deliberate and more variable adjustment of compound motions, duly restrained and proportioned. It is thus with the passions and sentiments in the less developed natures and in the more developed natures. Where there is but little emotional complexity, an emotion, when excited by some occurrence, explodes in action before the other emotions have been

called into play; and each of these, from time to time, does the like. But the more complex emotional structure is one in which these simpler emotions are so co-ordinated that they do not act independently. Before excitement of any one has had time to cause action, some excitement has been communicated to others—often antagonistic ones—and the conduct becomes modified in adjustment to the combined dictates. Hence results a decreased impulsiveness, and also a greater persistence. The conduct pursued, being prompted by several emotions co-operating in degrees which do not exhaust them, acquires a greater continuity; and while spasmodic force becomes less conspicuous, there is an increase in the total energy. Examining the facts from this point of view, there are sundry questions of interest to be put respecting the different races of men. (a) To what other traits than degree of mental evolution is impulsiveness related? Apart from difference in elevation of type, the New-World races seem to be less impulsive than the Old-World races. Is this due to constitutional apathy? Can there be traced (other things equal) a relation between physical vivacity and mental impulsiveness? (b) What connection is there between this trait and the social state? Clearly a very explosive nature—such as that of the Bushman—is unfit for social union; and, commonly, social union, when by any means established, checks impulsiveness. (c) What respective shares in checking impulsiveness are taken by the feelings which the social state fosters—such as the fear of surrounding individuals, the instinct of sociality, the desire to accumulate property, the sympathetic feelings, the sentiment of justice? These, which require a social environment for their development, all of them involve imaginations of consequences more or less distant; and thus imply checks upon the promptings of the simpler passions. Hence arise the questions—In what order, in what degrees, and in what combinations, do they come into play?

7. One further general inquiry of a different kind may be added. What effect is produced on mental nature by mixture of races? There is reason for believing that throughout the animal kingdom, the union of varieties that have become widely divergent is physically injurious; while the union of slightly divergent varieties is physically beneficial. Does the like hold with the mental nature? Some facts seem to show that mixture of human races extremely unlike produces a worthless type of mind—a mind fitted neither for the kind of life led by the higher of the two races, nor for that led by the lower—a mind out of adjustment to all conditions of life. Contrariwise, we find that peoples of the same stock, slightly differentiated by lives carried on in unlike circumstances for many generations, produce by mixture a mental type having certain superiorities.

In his work on *The Huguenots*, Mr. Smiles points out how large a number of distinguished men among us have descended from Flemish and French refugees; and M. Alphonse De Candolle, in his *Histoire des Sciences et des Savants depuis deux Siècles*, shows that the descendants of French refugees in Switzerland have produced an unusually great proportion of scientific men. Though, in part, this result may be ascribed to the original natures of such refugees, who must have had that independence which is a chief factor in originality, yet it is probably in part due to mixture of races. For thinking this, we have evidence which is not open to two interpretations. Professor Morley draws attention to the fact that, during seven hundred years of our early history, "the best genius of England sprang up on the line of country in which Celts and Anglo-Saxons came together." In like manner, Mr. Galton, in his *English Men of Science*, shows that in recent days these have mostly come from an inland region, running generally from north to south, which we may reasonably presume contains more mixed blood than do the regions east and west of it. Such a result seems probable *a priori*. Two natures respectively adapted to slightly unlike sets of social conditions, may be expected by their union to produce a nature somewhat more plastic than either—a nature more impressible by the new circumstances of advancing social life, and therefore more likely to originate new ideas and display modified sentiments. The comparative psychology of man may, then, fitly include the mental effects of mixture; and among derivative inquiries we may ask—How far the conquest of race by race has been instrumental in advancing civilization by aiding mixture, as well as in other ways?

II.—The second of the three leading divisions named at the outset is less extensive. Still, concerning the relative mental natures of the sexes in each race, questions of much interest and importance may be raised.

1. *Degree of difference between the sexes.*—It is an established fact that, physically considered, the contrast between males and females is not equally great in all types of mankind. The bearded races, for instance, show us a greater unlikeness between the two than do the beardless races. Among South American tribes, men and women have a greater general resemblance in form, &c., than is usual elsewhere. The question, then, suggests itself, Do the mental natures of the sexes differ in a constant or in a variable degree? The difference is unlikely to be a constant one; and, looking for variation, we may ask what is its amount, and under what conditions does it occur?

2. *Difference in mass and in complexity.*—The comparisons



between the sexes, of course, admit of subdivisions parallel to those made in the comparisons between the races. Relative mental mass and relative mental complexity have chiefly to be observed. Assuming that the great inequality in the cost of reproduction to the two sexes is the cause of unlikeness in mental mass, as in physical mass, this difference may be studied in connection with reproductive differences presented by the various races, in respect of the ages at which reproduction commences, and the periods over which it lasts. An allied inquiry may be joined with this; namely, how far the mental developments of the two sexes are affected by their relative habits in respect to food and physical exertion? In many of the lower races, the women, treated with great brutality, are, physically, very inferior to the men: excess of labour and defect of nutrition being apparently the combined causes. Is any arrest of mental development simultaneously caused?

3. *Variation of the differences.*—If the unlikeness, physical and mental, of the sexes is not constant, then, supposing all races have diverged from one original stock, it follows that there must have been transmission of accumulated differences to those of the same sex in posterity. If, for instance, the prehistoric type of man was beardless, then the production of a bearded variety implies that within that variety the males continued to transmit an increasing amount of beard to descendants of the same sex. This limitation of heredity by sex, shown us in multitudinous ways throughout the animal kingdom, probably applies to the cerebral structures as much as to other structures. Hence the question—Do not the mental natures of the sexes in alien types of Man diverge in unlike ways and degrees?

4. *Causes of the differences.*—Is any relation to be traced between this variable difference and the variable parts the sexes play in the business of life? Assuming the cumulative effects of habit on function and structure, as well as the limitation of heredity by sex, it is to be expected that if, in any society, the activities of one sex, generation after generation, differ from those of the other, there will arise sexual adaptations of mind. Some instances in illustration may be named. Among the Africans of Loango and other districts, as also among some of the Indian Hill-tribes, the men and women are strongly contrasted as respectively inert and energetic: the industry of the women having apparently become so natural to them that no coercion is needed. Of course, such facts suggest an extensive series of questions. Limitation of heredity by sex may account both for those sexual differences of mind which distinguish men and women in all races, and for those which distinguish them in each race, or each society. An interesting subordinate

inquiry may be, how far such mental differences are inverted in cases where there is inversion of social and domestic relations; as among those Khasi Hill-tribes whose women have so far the upper hand that they turn off their husbands in a summary way if they displease them.

5. *Mental modifiability in the two sexes.*—Along with comparisons of races in respect of mental plasticity may go parallel comparisons of the sexes in each race. Is it true always, as it appears to be generally true, that women are less modifiable than men? The relative conservatism of women—their greater adhesion to established ideas and practices—is manifest in many civilized and semi-civilized societies. Is it so among the uncivilized? A curious instance of greater adhesion to custom by women than by men is given by Dalton, as occurring among the Juangs, one of the lowest wild tribes of Bengal. Until recently the only dress of both sexes was something less than that which the Hebrew legend gives to Adam and Eve. Years ago the men were led to adopt a cloth bandage round the loins, in place of the bunch of leaves; but the women adhered to the aboriginal habit: a conservatism shown where it might have been least expected.

6. *The sexual sentiment.*—Results of value may be looked for from comparisons of races made to determine the amounts and characters of the higher feelings to which the relation of the sexes gives rise. The lowest varieties of mankind have but small endowments of these feelings. Among varieties of higher types, such as the Malayo-Polynesians, these feelings seem considerably developed: the Dyaks, for instance, sometimes display them in great strength. Speaking generally, they appear to become stronger with the advance of civilization. Several subordinate inquiries may be named. (a) How far is development of the sexual sentiment dependent upon intellectual advance—upon growth of imaginative power? (b) How far is it related to emotional advance; and especially to evolution of those emotions which originate from sympathy? What are its relations to polyandry and polygyny? (c) Does it not tend towards, and is it not fostered by, monogamy? (d) What connection has it with maintenance of the family bond, and the consequent better rearing of children?

III.—Under the third head, to which we may now pass, come the more special traits of the different races.

1. *Imitateness.*—One of the characteristics in which the lower types of men show us a smaller departure from reflex action than do the higher types, is their strong tendency to mimic the motions and sounds made by others—an almost in-

voluntary habit which travellers find it difficult to check. This meaningless repetition, which seems to imply that the idea of an observed action cannot be framed in the mind of the observer without tending forthwith to discharge itself in the action conceived (and every ideal action is a nascent form of the consciousness accompanying performance of such action), evidently diverges but little from the automatic; and decrease of it is to be expected along with increase of self-regulating power. This trait of automatic mimicry is evidently allied with that less automatic mimicry which shows itself in greater persistence of customs. For customs adopted by each generation from the last, without thought or inquiry, imply a tendency to imitate which overmasters critical and sceptical tendencies: so maintaining habits for which no reason can be given. The decrease of this irrational mimicry, strongest in the lowest savage and feeblest in the highest of the civilized, should be studied along with the successively higher stages of social life, as being at once an aid and a hindrance to civilization: an aid in so far as it gives that fixity to the social organization without which a society cannot survive; a hindrance in so far as it offers resistance to changes of social organization that have become desirable.

2. *Incuriosity*.—Projecting our own natures into the circumstances of the savage, we imagine ourselves as marveling greatly on first seeing the products and appliances of civilized life. But we err in supposing that the savage has feelings such as we should have in his place. Want of rational curiosity respecting these incomprehensible novelties, is a trait remarked of the lowest races wherever found; and the partially-civilized races are distinguished from them as exhibiting rational curiosity. The relation of this trait to the intellectual nature, to the emotional nature, and to the social state, should be studied.

3. *Quality of thought*.—Under this vague head may be placed many sets of inquiries, each of them extensive—(a) The degree of generality of the ideas; (b) the degree of abstractness of the ideas; (c) the degree of definiteness of the ideas; (d) the degree of coherence of the ideas; (e) the extent to which there have been developed such notions as those of *class*, of *cause*, of *uniformity*, of *law*, of *truth*. Many conceptions which have become so familiar to us that we assume them to be the common property of all minds, are no more possessed by the lowest savages than they are by our own children; and comparisons of types should be so made as to elucidate the processes by which such conceptions are reached. The development under each head has to be observed—(a) independently in its

successive stages; (b) in connection with the co-operative intellectual conceptions; (c) in connection with the progress of language, of the arts, and of social organization. Already linguistic phenomena have been used in aid of such inquiries; and more systematic use of them should be made. Not only the number of general words, and the number of abstract words, in a people's vocabulary should be taken as evidence, but also their *degrees* of generality and abstractness; for there are generalities of the first, second, third, &c., orders and abstractions similarly ascending in degree. *Blue* is an abstraction referring to one class of impressions derived from visible objects; *colour* is a higher abstraction referring to many such classes of visual impressions; *property* is a still higher abstraction referring to classes of impressions received not through the eyes alone, but through other sense-organs. If generalities and abstractions were arranged in the order of their extensiveness and in their grades, tests would be obtained which, applied to the vocabularies of the uncivilized, would yield definite evidence of the intellectual stages reached.

4. *Peculiar aptitudes.*—To such specialities of intelligence as mark different degrees of evolution, have to be added the minor ones related to modes of life: the kinds and degrees of faculty which have become organized in adaptation to daily habits—skill in the use of weapons, powers of tracking, quick discrimination of individual objects. And under this head may fitly come inquiries concerning some race-peculiarities of the æsthetic class, not at present explicable. While the remains from the Dordogne caves show us that their inhabitants, low as we must suppose them to have been, could represent animals, both by drawing and carving, with some degree of fidelity; there are existing races, probably higher in other respects, who seem scarcely capable of recognizing pictorial representations. Similarly with the musical faculty. Almost or quite wanting in some inferior races, we find it in other races, not of high grade, developed to an unexpected degree: instance the Negroes, some of whom are so innately musical, that, as I have been told by a missionary among them, the children in native schools, when taught European psalm-tunes, spontaneously sing seconds to them. Whether any causes can be discovered for race-peculiarities of this kind, is a question of interest.

5. *Specialities of emotional nature.*—These are worthy of careful study, as being intimately related to social phenomena—to the possibility of social progress, and to the nature of the social structure. Of those to be chiefly noted there are—(a) Gregariousness or sociality—a trait in the strength of which races differ widely: some, as the Mantras, being almost indifferent to

social intercourse; others being unable to dispense with it. Obviously the degree of the desire for the presence of fellow-men, affects greatly the formation of social groups, and consequently underlies social progress. (b) Intolerance of restraint. Men of some inferior types, as the Mapuché, are ungovernable; while those of other types, no higher in grade, not only submit to restraint, but admire the persons exercising it. These contrasted traits have to be observed in connection with social evolution; to the early stages of which they are respectively antagonistic and favourable. (c) The desire for praise is a trait which, common to all races, high and low, varies considerably in degree. There are quite inferior races, as some of those in the Pacific States, whose members sacrifice without stint to gain the applause which lavish generosity brings; while, elsewhere, applause is sought with less eagerness. Notice should be taken of the connection between this love of approbation and the social restraints; since it plays an important part in the maintenance of them. (d) The acquisitive propensity. This, too, is a trait the various degrees of which, and the relations of which to the social state, have to be especially noted. The desire for property grows along with the possibility of gratifying it; and this, extremely small among the lowest men, increases as social development goes on. With the advance from tribal property to family property and individual property, the notion of private right of possession gains definiteness, and the love of acquisition strengthens. Each step towards an orderly social state, makes larger accumulations possible, and the pleasures achievable by them more sure; while the resulting encouragement to accumulate, leads to increase of capital and further progress. This action and re-action of the sentiment and the social state, should be in every case observed.

6. *The altruistic sentiments.*—Coming last, these are also highest. The evolution of them in the course of civilization shows us very clearly the reciprocal influences of the social unit and the social organism. On the one hand, there can be no sympathy, nor any of the sentiments which sympathy generates, unless there are fellow-beings around. On the other hand, maintenance of union with fellow-beings depends in part on the presence of sympathy, and the resulting restraints on conduct. Gregariousness or sociality favours the growth of sympathy; increased sympathy conduces to closer sociality and a more stable social state; and so, continuously, each increment of the one makes possible a further increment of the other. Comparisons of the altruistic sentiments resulting from sympathy, as exhibited in different types of men and different social states, may be conveniently arranged under three heads—(a) Pity, which should



be observed as displayed towards offspring, towards the sick and aged, and towards enemies. (b) Generosity (duly discriminated from the love of display) as shown in giving; as shown in the relinquishment of pleasures for the sake of others; as shown by active efforts on others' behalf. The manifestations of this sentiment, too, are to be noted in respect of their range—whether they are limited to relatives; whether they extend only to those of the same society; whether they extend to those of other societies; and they are also to be noted in connection with the degree of providence—whether they result from sudden impulses obeyed without counting the cost, or go along with a clear foresight of the future sacrifices entailed. (c) Justice. This most abstract of the altruistic sentiments is to be considered under aspects like those just named, as well as under many other aspects—how far it is shown in regard to the lives of others; how far in regard to their property; how far in regard to their various minor claims. And the comparisons of men in respect of this highest sentiment should, beyond all others, be carried on along with observations on the accompanying social state, which it largely determines—the form and actions of government; the character of the laws; the relations of classes.

Such, stated as briefly as consists with clearness, are the leading divisions and subdivisions under which the Comparative Psychology of Man may be arranged. In going rapidly over so wide a field, I have doubtless overlooked much that should be included. Doubtless, too, various of the inquiries named will branch out into subordinate inquiries well worth pursuing. Even as it is, however, the programme is extensive enough to occupy numerous investigators, who may with advantage take separate divisions.

Though, after occupying themselves with primitive arts and products, anthropologists have devoted their attention mainly to the physical characters of the human races; it must, I think, be admitted that the study of these yields in importance to the study of their psychological characters. The general conclusions to which the first set of inquiries may lead, cannot so much affect our views respecting the highest classes of phenomena as can the general conclusions to which the second set may lead. A true theory of the human mind vitally concerns us; and systematic comparisons of human minds, differing in their kinds and grades, will help us in forming a true theory. Knowledge of the reciprocal relations between the characters of men and the characters of the societies they form, must influence profoundly our ideas of political arrangements. When the interdependence of individual nature and social structure is understood, our con-

ceptions of the changes now taking place, and hereafter to take place, will be rectified. A comprehension of mental development as a process of adaptation to social conditions, which are continually remoulding the mind, and are again remoulded by it, will conduce to a salutary consciousness of the remoter effects produced by institutions upon character; and will check the grave mischiefs which ignorant legislation now causes. Lastly, a right theory of mental evolution as exhibited by humanity at large, giving a key, as it does, to the evolution of the individual mind, must help to rationalize our perverse methods of education; and so to raise intellectual power and moral nature.

## DISCUSSION.

MR. HYDE CLARKE said that the council had always been most desirous of promoting the study of psychology, and, on his proposition, had instituted a section, of which he had been named chairman. Although he had prepared an address, its delivery had been delayed, and he was glad Mr. Spencer had come forward and accomplished the task so ably. Mr. Spencer concurred with him in the adoption of the term "comparative psychology." At the same time, he (the speaker) had intended thereby to promote the study of the phenomena of animals, which sometimes gave safer opportunities for observation. While acknowledging the wide appreciation of the subject displayed by Mr. Spencer, it might be thought to tend rather to sociology than to psychology. Much delay had been caused in the development of the section by the desire of some persons to employ it chiefly for what was called spiritualism and mesmerism, but which did not receive the assent of the majority of the men of science on the council.

MR. MONCURE CONWAY said that the very valuable paper to which they had listened contained many seeds of thought, and, indeed, was for the most part expressed in the form of inquiries. In some instances Mr. Spencer had indicated positive views on novel points, and among these one appeared to require further investigation—namely, the opinion that women are more conservative than men. Mr. Conway suspected that in coming to this conclusion some men have made a mistake parallel to one against which Mr. Spencer has wisely warned us in his paper, that of expecting savages to look upon the works of civilisation with the same admiration as we should feel if beholding them for the first time. Men are liable to estimate the conservatism of women in exclusive relation to spheres of interest and action which belong to men alone, and into which women are not admitted with any large degree of freedom. Women have not the training and knowledge in those governmental and philosophical matters which we usually think of when we speak of conservatism to inspire them with the interest and courage required for progressive movement. But if we consider women in the domain of their own interest and enlightenment,

he (Mr. Conway) believed they would not be found more conservative than men. In the home, in family government, any remnant of the hard patriarchal or feudal idea is more generally represented by the father: the mother is more apt to mediate in the interest of newer and more liberal ideas of discipline and of household freedom.

Mr. SAUNDERS, while eulogising the philosophical author and his paper, contended that in bringing so wide a field of materialistic research within the limits of comparative psychology, the author should not be considered as having assigned to that branch of science the bounds which he would ultimately give to it in a general scheme of human knowledge. The paper seemed to point to the correlations of psychology with other subjects rather than to its special limitations. Indeed, it seemed to be much easier to exhibit the connections of distinct branches of science with each other than to assign their limits. Comparative psychology should define the characteristic differences of thought which distinguish one psychological group of mankind from another. This is a subtle study of itself, besides beset with linguistic difficulties. It is chiefly concerned in detecting the ruling ideas and motives, in regard to which material forms and conditions may be quite accidental.

Mr. MUGGERIDGE observed that, speaking with diffidence in the presence of those who were so much better informed than himself, he believed that he was correct in saying that the highest forms of intelligence were not due to the increased magnitude of the mass of brain, but to the greater *number of its convolutions*. It is so with the whole animal creation. In the lowest creatures that may lay claim to brain it appears in the shape of a thread of grey matter; its intellect just enables it to live. He need not take up time by showing how the increase of intellectual power follows; firstly, the massing of the brain; secondly—and that was the point at which he would arrive—the increasing number of its convolutions. Thus the greater the multiplicity of those foldings, the larger is the amount of intellect. He would therefore ask, whether the same rule obtains in the different races of mankind?—whether, *e.g.*, the brain of the African bushman has fewer convolutions than that of the European?

Prof. ROLLESTON, Prof. BUSK, Mr. LUKE BURKE, Mr. HARRISON, and the PRESIDENT also joined in the discussion.

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The author read a paper as follows:—

*On the NATIVES of CENTRAL and WESTERN AUSTRALIA.*  
By JOHN FORREST, F.R.G.S.

It is with much pleasure I accede to the request of the President of this Institute to give a short account of habits and manners of the aboriginals of Central Australia; and although it is not a very complete account, I trust it will be found gene-

rally correct. I have had good opportunities for observing, having been three times in command of exploring expeditions, and twice crossed from Western to South Australia.

The natives of the interior of Australia are a very peculiar, though in their own way a very intelligent people; this is seen and known as civilisation forces its way, little by little, and takes possession of their haunts, and in a very short time they become very useful to the pioneer settlers. The natives of Western Australia are divided into tribes, which bear certain names; there are several, but they all merge into two great tribes, called the "Tornderup" and the "Ballarook." Wherever a native goes, so long as he does not go beyond the limit of these tribes, he will always be protected by his own tribe, although he may be a perfect stranger to them; in fact they look upon him as a brother.

The marriage laws are also very strict. A Tornderup must not marry a Tornderup, although she may be quite a stranger; if he wants a wife he must take a "Ballarook." Sometimes they break through this rule, and generally get speared or killed for their pains. They are constantly quarrelling about their wives, and running away with one another's wives is very common. The poor women generally get the worst of it, being often speared, and even sometimes killed. Still, even this severe punishment does not deter them, and it is just as common now as it was forty years ago. Betrothal is very general. A child a year old will sometimes be betrothed to an old man, and it will be his duty to protect and feed her, and (unless she is stolen by some one else) when she is old enough she becomes his wife. In the case of a husband's death his wife belongs to the oldest man of his family, who either takes her himself or gives her to some one else. There is no marriage ceremony merely handing over the woman to the man. Children always take after the mother's tribe. If a mother is "Tornderup" the child is "Tornderup," and so on.

In their natural state they never wash themselves, but in hot weather (if there are any rivers) often bathe to keep themselves cool. They grease and cover themselves with ochre (which they call "nilgie") to keep away the flies, and also to adorn themselves. Grease and dirt no doubt keep out the cold in winter, although I never heard of their knowing it. Tattooing and marking themselves on the shoulder, back, and breast are very common, indeed almost universal amongst them; boring their noses also is quite a ceremony with them, and once a year hundreds gather together in order to bore the noses of the younger men, and also to cut one another's hair.

The rite of circumcision is also universal with all I have met,

except those belonging to the south-west corner of Australia; it is a sort of religious ceremony with them. They gather together in large numbers, and the men and women part for a fortnight or more, and are not expected to see one another; if they accidentally meet they run for their lives. All the natives of the interior of Australia are entirely without clothing. Men, women, and children have no idea of wearing clothing, and are as naked as the day they were born. They pass very restless nights on account of the cold, and are continually getting up to make up the fire. They sleep in a row, with a fire on each side of them. They first make a little hollow in the ground, put some warm ashes into it, and lie down. In very wet weather they build huts of wood and thatch them with grass (I only refer to the natives of the interior, as those on the coast make first-rate huts). They might easily make rugs from the kangaroo and wallaby skins, but they never do.

I believe they have a sort of belief in a supreme being, but they cannot tell you much about it. In the south-west corner of Australia the name for father and mother is the same as for God and Son; for instance, *mammon* means father, or the supreme ruler of all, and *gnengham* means mother and also the son. Amongst all the aborigines there are wise men or doctors, called by some tribes "boolya," or that they have the "boolya" or spirit. If anyone is ill these doctors perform on them in the following manner: They find out the place that is affected and then rub and press it, and pretend to take hold of something and put it into themselves, then give a shout, and continue this for some time, and give extraordinary reasons for the illness, which are believed by all.

If a native has a bad leg, or even heart disease, and if he is getting better, the doctor will often produce a polished point of a spear that he has miraculously taken out, and he will be believed; but the strange part is, that should this doctor be taken ill himself he will at once send for another, and as thoroughly believe in his powers. Even after they become civilised they have a belief in these customs, and always avail themselves of them.

Almost everything in the Australian bush is good to eat, and the natives eat anything and everything. Kangaroo, emu, wallabies and other rats, snakes, guanas, mice, grubs, birds, roots, seeds, and many other things are collected and eaten; they live from hand to mouth, never collect more than enough for the day, and each morning have to look out for their day's food. In wet weather they go often a day or two without food, as they do not like hunting in the wet. It cannot be very comfortable going about in wet weather in your naked skin.



They have many clever ways of catching and procuring their food. The kangaroo is generally speared and sometimes run down, especially in wet weather when the ground is boggy. The emu (unlike the kangaroo and all marsupial animals) must have water regularly, and is generally killed by waiting at the water and spearing it then, or even sometimes by a man getting so close to where they know it will water as to catch hold of one of its legs and to strike it on the head with a club. In like manner, whether it is killing a kangaroo or emu, or getting opossums out of trees, they are great experts at securing their food, and are up to every possible contrivance.

They are full of superstitions, and it is impossible to make them disbelieve them. They have a belief in a soul or spirit, for when they kill one another they believe the soul or "cainga" follows the murderer at night and that he can hear it call. They also believe in a devil or evil spirit, and are afraid to go about in the dark. Some have assured me that they have seen the devil. When anyone is ill the evil spirit is the cause, and the doctor runs round and round the sick man, shouting for hours in order to keep away the devil. They do not believe in natural death, at least they think some other native has been immediately the cause, and they generally kill him for it; if he should by chance hear he is suspected he flies for his life to a distant part, and remains away a long time.

Cannibalism is common among the natives of the interior. I myself have found a skull all charred at a native's fire, and there are instances of their eating even white children. I recollect a white child being killed and eaten, and it was not until eight years after that it was discovered what became of it, and the native was hung. I have often wondered what they did (in the interior) with their dead; in all my travels I have only seen the graves of two; it is a question whether they do not often eat them. The natives have told me that it is often done.

The women are nearly slaves, having to do most of the hard work, such as making huts, carrying wood, and also carrying all the baggage, which includes many weapons, grease, "wilgie," and a host of articles, wooden dishes, &c., besides often a child. They carry these things in net bags, making the string from the inner bark of a tree. The man does not generally carry much, except his spears, &c. The spears are often difficult to procure in places where there is only low acacia scrub; they then get a pithy reed and splice a hard piece on to each end, which makes a very good spear.

Dancing is very general, called "corrobbering" in some parts; there are many different kinds of dances in which women often take part. The men are all painted and plumed for the

occasion, and (in the interior) it is the worst time to approach their camps, as they are in large numbers and generally war-like. After a dance they generally finish up with a fight, and often kill a few of each other. Singing also is very general, and different chants are taught from one tribe to another, and it is astonishing how far they travel. The songs generally have no meaning, only a few words that run well together and are repeated over and over again. Some of their songs have been set to music, and sound very well. It is very pretty to hear twenty or thirty singing together, and they have a very correct idea of keeping time.

They have great power of observation, and it is almost marvellous their knowledge of one another's tracks; by looking at a track they can tell which of their friends has gone along. They are very useful as police assistants, and it is almost impossible for a prisoner to escape from them. Water is very scarce in the interior of Australia, and they are very careful in preserving it—and while on this head, I may mention a strange formation in Australia, viz. the "rock water-hole." This is a natural cavity in a rock which catches the rain-water, and is sometimes very large and more often very small. They are the chief watering-places of the natives, and are all known and camped at, even if the cavity holds only a gallon; but the strange thing is that these cavities or receptacles are only found in country which is destitute of rivers, and very few springs.

If you are in a country abounding with rivers and springs you never, or at least scarcely ever, find the rock water-hole, although there are plenty of rocks and likely places for the receptacles; on the other hand, if you are in a country where there are no springs or rivers, every piece of rising rocky ground has these receptacles. They are in the granite, in the limestone all along the Australian bight, and in the desert sandstone of Central Australia, and are peculiar in Australia to a badly watered country. The rock water-holes are very carefully preserved by the natives, by putting stones in and over them, and also covering them with bushes to keep the water from evaporating.

Water is also procured from the hollow eucalyptus trees; also very commonly from the roots of trees. They select the proper roots, break them in pieces and stand them on end in a wooden dish, which catches all the water that is in them. By this means they often travel far away from any permanent water.

The knowledge of arts of the aboriginals of Australia, as far as I have observed, is confined to weapons and contrivances to procure subsistence.

The spear is universal, and is pointed in a variety of ways; sometimes barbed at the point, the barb being spliced on; at other times notched; but nearly all have some kind of barb, and are all thrown with a "wommerra," which is retained in the hand while the spear is thrown.

Another weapon is the dowak, which is a heavy stick pointed at one end and with a piece of flint gummed on the other, which is used as a small axe. It is thrown very swiftly and is very dangerous.

The boomerang or kylee is used for warfare or for amusement, and also to kill birds when they go in flocks. This weapon requires to be made very true, in order to make it revolve well in the air and to return to the thrower.

Shields are also very common, and must take a great deal of time and patience to make without chisel or knife and with only a sharp stone. The front of the shield is grooved; on the back is a handle, generally tied on, but sometimes they are all of one piece.

Nets are also made, and used in the interior for snaring small game, and also to carry their effects; they are made from string that is formed out of the inner bark of a tree. String is also made from the wool of the opossum and other animals; it is twisted up in a very ingenious manner, and the belt is always made of this, wound round and round the body, occupying an hour's work to take it off, which, however, they seldom do.

Wooden dishes are very common, made from the bend of a eucalyptus tree. By dint of patience and hard work they manage to press off the outer covering of the wood (taking off the bark first), and by scraping and burning make a first-rate dish.

It is very astonishing how they carve and decorate their weapons, only having sharp pieces of stone to do it with. They soon learn the use of the axe, chisel, and knife, and are not long in getting possession of them.

I have written this short account very hurriedly, and I fear it is not very well arranged. I have attempted to give a short description of what I have seen myself, and trust it will not be altogether without interest. It is a subject on which volumes might be written. The native races of Australia are fast dying out; wherever civilisation goes they disappear, so much so, that in South Australia and Victoria there are very few left, and it is quite rare you see one. Although very low specimens of humanity in many ways, still when civilised they are a very intelligent and good-natured people, and I have received many kindnesses from them.

Mr. SAUNDERS, Dr. SIMMS, Mr. CHARLESWORTH, and the PRESIDENT having offered some remarks, the author briefly replied.

Mr. Rudler read a paper on "The Papuans of New Guinea," by Captain Lawson—for the author.

The meeting then adjourned till November.

NOVEMBER 9TH, 1875.

Colonel A. LANE FOX, *President, in the Chair.*

The minutes of the last ordinary meeting were read and confirmed.

Major T. F. WISDEN, of Broadwater, Worthing, was elected a member.

The following list of presents was announced, and the thanks of the meeting were voted to the respective donors thereof:

FOR THE LIBRARY.

From the INSTITUTION.—Journal of the Royal United Service Institution. Vol. XIX. Nos. 80—82.

From the SOCIETY.—Transactions of the Royal Society of Literature. Vol. XI. Part 1.

From the EDITOR.—Revue Scientifique. Nos. 52 and 1—19, 1875.

From the BOARD.—Report of the Board of Public Charities, Pennsylvania. 1874.

From Prof. F. V. HAYDEN.—Birds of the North-West. U.S. Geological Survey, 1874; by Elliott Coues. Bulletin of the U.S. Geological Survey; Nos. 2 and 3. Report of the U.S. Geological Survey of the Territories; by Prof. Hayden. Six Maps (Geological, &c.) of Colorado, &c.; by Prof. F. V. Hayden.

From the SOCIETY.—Bulletin de la Société Impériale des Naturalistes de Moscou. No. 4, 1874; No. 1, 1875.

From the SOCIETY.—Transactions of the Royal Society of Victoria. Vol. XI.

From the SOCIETY.—Proceedings of the Royal Geographical Society; Vol. XIX. No. 81. President's Annual Address, 1875.

From the ACADEMY.—Bulletin de l'Académie Impériale des Sciences de St. Petersburg. Vol. XIX. Nos. 4 and 5; Vol. XX. Nos. 1 and 2.

- From the ASSOCIATION.—Report of the British Association for the Advancement of Science. 1874.
- From the SOCIETY.—Proceedings of the Royal Society. Vol. XXIII. Nos. 162 and 163.
- From the REGISTRAR-GENERAL OF NEW ZEALAND.—Result of a Census of the Colony of New Zealand. March, 1874.
- From the SOCIETY.—Journal of the Asiatic Society of Bengal; Part 1, No. 1; Part 2, Nos. 1—4. Proceedings of ditto; Nos. 2, 3, 4, 5, and 6, 1875.
- From the ASSOCIATION.—Journal of the East India Association. Vol. IX. Nos. 1 and 2.
- From the EDITOR.—Matériaux pour l'Histoire primitive et naturelle de l'Homme. Vol. VI. Nos. 7, 8, and 9; Supplement to Vol. VI.
- From the SOCIETY.—Transactions of the Watford Natural History Society. Vol. I. Parts 1 and 2.
- From the SOCIETY.—Memoirs of the Boston Society of Natural History; Vol. II. Part 3, Nos. 3, 4, and 5; Part 4, No. 1. Proceedings of ditto; Vol. XVI. Nos. 3 and 4; Vol. XVII. Nos. 1 and 2. Jeffries Wyman: Memorial Meeting, October, 1874.
- From JAMES BURNS, Esq.—Human Nature for July, August, September, and October.
- From the AUTHOR.—Gout at the Heart. By Dr. Eldridge Spratt.
- From the SOCIETY.—Jahrbuch der K. K. Geologischen Reichsanstalt; Vol. XXVI. No. 2. Verhandlungen, ditto, Nos. 6—10.
- From the SOCIETY.—Mittheilungen der Anthropologischen Gesellschaft in Wien. Vol. V. Nos. 4—9.
- From Messrs. LONGMANS AND Co.—Native Races of the Pacific States of North America. Vols. III. and IV. By H. H. Bancroft.
- From the EDITOR.—Archiv für Anthropologie, Band viii. No. 5.
- From the ASSOCIATION.—Proceedings of the Geologists' Association. Vol. IV. No. 3.
- From the SOCIETY.—Proceedings of the Philosophical Society of Glasgow. Vol. IX. No. 2.
- From the SOCIETY.—Transactions of the Society of Biblical Archaeology. Vol. VI. Part 1.
- From the AUTHOR.—Logic and Metaphysics. By T. S. Barrett.
- From the SOCIETY.—Proceedings of the Society of Antiquaries of London. Vol. VI. No. 4.
- From the SOCIETY.—Journal of the Asiatic Society of Great Britain and Ireland. Vol. VII. Part 2.
- From the INSTITUTION.—Journal of the Royal Institution of Cornwall. No. 17, 1875.
- From the INSTITUTE.—Proceedings of the Royal Colonial Institute from 1869 to 1875.
- From the SOCIETY.—Bulletin de la Société d'Anthropologie de Paris. Vol. IX. No. 4; Vol. X. Nos. 2 and 3.



From the SOCIETY.—Transactions of the American Philosophical Society; Vol. XV. Part 2. Proceedings of ditto; Vol. XIV. No. 94.

From the INSTITUTE.—The Canadian Journal. Vol. XIV. No. 5.

From the ASSOCIATION.—Transactions of the Devonshire Association. Vol. VII.

From the EXECUTORS of the late HENRY CHRISTY, Esq.—*Reliquiæ Aquitanicæ*. Part XVII. November, 1875.

From the ASSOCIATION.—Journal of the Royal Historical and Archæological Association of Ireland. Vol. III. No. 21.

From M. VALDEMAR DE MAINOFF.—*Ethnographic Map of the Russian Empire; Mongolia and Tangut*. By N. Przhevalskago.

From the AUTHOR.—Address, Department of Anthropology, British Association, Bristol, August 25th, 1875. By Prof. George Rolleston, F.R.S.

From the EDITOR.—*Nature* (to date).

From the SOCIETY.—Proceedings of the Society of Antiquaries of Scotland. Vol. IX. Part 2; Vol. X. Part 1.

From the AUTHOR.—*Naturalist's Rambles in the China Seas*. By Dr. C. Collingwood.

From the INSTITUTE.—The Smithsonian Report. 1875.

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The Director read the following Resolution, which had been passed by the Council on that day:—

"Proposed by the President, seconded by Mr. Francis Galton, F.R.S., and  
"unanimously resolved—

"That this Council desire to place on record their esteem for the character,  
"and regret at the untimely death, of Commodore Goodenough, whose  
"life was sacrificed in the service of his country, and in the promotion  
"of anthropological science. They ask leave to offer their sincere and  
"respectful condolence to Mrs. Goodenough; and are the more moved  
"to do this by the recollection of the services rendered to science by  
"her lamented father, Mr. Hamilton."

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The following papers were read by the author:

*Short Notes on HEREDITY, &c., in TWINS*. By FRANCIS GALTON, F.R.S. [With Woodcut.]

SOME subsidiary results that I obtained in an inquiry into the resemblances between twins, are perhaps worth recording as a separate memoir. My primary results were published in *Fraser's Magazine*, November, 1875, and are reprinted, with revision, among the miscellanies in this volume.

What I am now going to give, concerns the hereditary tendency towards twin-bearing, the largeness of the families in which twins are born, the degree in which they themselves contribute to the population, and the conditions of their sex.

First, in respect to heredity. It was impracticable to judge of this from my returns by any direct method. Twins do not marry so frequently as other people, and I think they are less fertile; hence the parents of twins, who are themselves one of a pair of twins, are relatively few, and the numerical ratio between such parents and the parents of twins generally, would be a fallacious test. Neither could I institute a direct comparison between two groups of children, one of whom were the offspring of fathers or mothers who themselves were of twin birth, and the other were not, because my material was insufficient. I therefore have confined myself to data derived from uncles and aunts.

I find with regard to 94 cases of twins, of whom I have sufficiently full returns, that they had a total of 1,065 uncles and aunts, and that among these there were 27 sets of twins.\* In other words, there were twice 27, or 54 persons, who were severally one of a pair of twins among the 1,065 uncles and aunts—say 1 in every 20.

In the population generally the proportion is not nearly so great, but it varies largely under different conditions; and I therefore prefer to compare my returns with those derived from parallel returns supplied by precisely the same classes, which have been drawn up by Mr. C. Ansell, junr., in his most valuable "*Statistics of Families of the Upper and Professional Classes of England.*" It was compiled at the cost and under the direction of the National Life Assurance Society, and leaves nothing to be desired in its completeness, terseness, and adequacy. From these we learn that there is 1 twin birth to about every 100 ordinary births; in other words, there are 2 persons, each severally a twin, among every 101 persons—say 1 in every 50.

Hence the chance of an uncle or aunt of a twin being himself or herself a twin, is as 50 to 20, or  $2\frac{1}{2}$  times as great as that of people generally. It may perhaps be thought simpler to state the result in this form:—Among the uncles and aunts of twins, there is an excess per cent. of three individuals of twin birth, due to hereditary causes. The average influence of heredity in fathers and in sons may be taken as fully five times as great as that in uncles and aunts; we should therefore expect, on general grounds, that the former would yield an excess of at least 15 per cent., or an absolute number of  $15 + 2 = 17$  per cent. of individuals who were twins; but this, I feel sure, is in excess of the truth. (I have discussed these hereditary ratios, so far as ability was concerned, in my "*Hereditary Genius*," p. 321.)

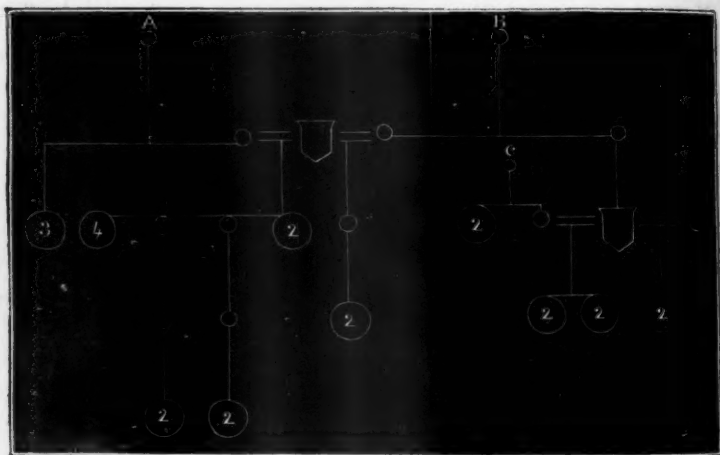
\* To save complexity, I include among these, three cases in which the parent was one of the twins.

Next, as regards the relative power of the male and female in transmitting an hereditary tendency to bear twins. I find that the 94 sets of twins above mentioned had—

On the father's side . . . .	538 uncles and aunts,
Among whom were . . . .	14 sets of twins.
On the mother's side . . . .	527 uncles and aunts,
Among whom were . . . .	13 sets of twins.

These numbers may be considered identical, in a statistical sense; hence the hereditary tendency is the same in the male and female lines.

The largeness of the families in which twins are born is sufficiently manifest from these returns, which happen to be the only ones I possess that can be adduced in proof of it. We see that 94 sets of twins had, on the father's side, a total of 538 uncles and aunts, which, added to the 94 fathers, makes



632 individuals in 94 families; this is at the rate of  $6\frac{3}{4}$  in each of the families of which the father of a twin was a member. Almost the same occurs (the precise figure is  $6\frac{1}{2}$ ) in each family of which the mother of a twin was a member.

I annex a curious instance of the intermarriage of three twin-bearing families, A, B, and C. They all consist of many individuals; but my information is a little imperfect, and even if it were not, it would hardly be necessary to give more details than the number of multiple births and the connecting links between them. I may add that the three families are well known socially, and have each of them distinguished members. The circles in the diagram indicate the cases of

multiple births, and the figures inside the circles show the number of children born on each of these occasions. It will be observed that in three generations there were produced one quadruplet, one triplet, and eight pairs of twins.

A very instructive fact has been related to me concerning a family remarkable for its twins; in which it appears, according to the mother's account, that whenever single children were born to her, they always had six fingers and six toes, but the sets of twins never had. This shows a strong constitutional tendency to multiple propagation.

The vigour of body and mind of those twins who survive infancy, who strongly resemble one another, and who have sent me returns, is certainly not below the average. On the contrary, I find, from the returns that I have received, that nearly one-half of them are decidedly above par; and thence I infer that more than one-half are somewhat above par. It is easy to adduce instances of vigorous twins. One of my own correspondents, a twin, was a senior wrangler; Lords Eldon and Stowell had each a twin sister; and among others who have successfully fought the battles of life may be mentioned Bendigo, the ex-champion pugilist, who was one of a triplet birth.

Notwithstanding Sir J. Simpson's statistical results,\* I still think the popular belief to be a true one, that twins contribute less to the population than other people. My returns were not framed to afford a direct answer to the question of their fertility; but I can incidentally gather enough from them to be sure of the fact; also that there is not so strong a tendency among twins to marry, as among other people (however this may be accounted for); and lastly, that the popular belief that both twins, whether of the same or opposite sexes, *never* have children, is erroneous, for I have many instances to the contrary.

There is nothing known in the human race, except as a great rarity, corresponding to the "free-martin" † in cattle; and where known, it has never yet been found, so far as I am aware, in connection with twin births. Neither is this peculiarity of neutral sex found in such domestic animals as dogs or cats, except in the rarest instances; but in the horse, ass, and sheep, and especially in cattle, it is comparatively common.

John Hunter's "Memoir on the Free-Martin" (vol. iv. p. 34,

\* Obstetrical Memories, i. p. 327.

† Marten seems originally to have meant an animal intended to be killed at Martinmas, which was the period in former years, before the introduction of root-crops, when cattle were slaughtered and salted down for the winter's food of the population. As barren cows were slaughtered preferably to others, the name of marten became especially applied to them. Why the animals about which I have been speaking were called free-martens, it is not altogether clear. Free might mean "naturally admitted to the privilege" of being slaughtered at Martinmas.

edition of 1837) is extremely curious. It appears that when a cow (he says he can only speak of black cattle, but I understand it is a more general fact) brings forth two calves, one of which is a bull calf and the other, to external appearance, a cow calf, the former grows up into a proper bull, but the latter does not commonly grow into a proper cow. The animal is unfit for propagation, and is kept for labour and fattening, like an ox; and it is as well known as a specific form of cattle as is the bull or cow, and is called a "free-martin" by farmers. Close examination and dissection show that the animal is neither a complete female nor male, but combines the anatomical characteristics of both in a very undeveloped and imperfect manner; and those of the male rather predominate over those of the female. This, at least, is the modern view. Hunter's three dissections of free-martins still exist in the Museum of the Royal College of Surgeons, in the teratological division. (See the catalogue of it, pp. 97—101.) Sir J. Simpson subsequently investigated the subject. His principal memoir, alluded to above, is most interesting; and there are several other allusions to free-martins, and to writers upon them, to be found elsewhere in the two volumes of his memoirs.

There is a peculiarity in the sexes of twins; they tend to accord. The word "twin" covers different classes of events—those in which each twin is derived from a separate ovum, and those in which they come from two germinal spots in the same ovum. In the former case they are enveloped, previously to their birth, in separate membranes; and in the latter in the same membrane. Now it appears that twins enveloped in the same membrane are invariably of the same sex, and these, according to the cases of Späeth, who has evidently taken great pains to secure reliable data,\* are 24 per cent. of the whole number. (This is, however, greatly in excess of other estimates, which usually give about 6 per cent.) In the remainder they have either one placenta between them, and two membranes, or else they are quite independent, and have separate placentas and membranes. The statistics as to members and sexes under these conditions, vary so astonishingly that I can conclude nothing concerning them. The general upshot is, that about twice as many twins are born of the same sex as of opposite sexes; whereas if there were no influences to produce accord, and on the supposition of an equality of male and female births generally, the numbers ought to be equal.†

\* "Studien über Zwillingen." Zeitschrift der Wiener Gesellschaft der Aerzte, 1860. Nos. 15 and 16.

† This is clear, as was pointed out by Mr. C. Ansell, from the following considerations. Supposing absolute independence of sex, the births may be: (1) boy



I have explained in my memoir above alluded to (reprinted in the miscellanies of this volume from *Fraser's Magazine*), that it is only among twins of the same sex, and therefore presumably only among twins derived from the same ovum, that we find an extremely close likeness, or else an extremely marked dissimilarity. On the other hand, in twins of the opposite sex, we find only an ordinary family likeness or dissimilarity. To this I shall recur in my Memoir on the Theory of Heredity that is about to be read, and I will now conclude the present one.

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*A THEORY OF HEREDITY.* By FRANCIS GALTON, F.R.S.\*

MR. DARWIN stated, in the year 1868, in the preface to his theory of Pangenesis,† that "every one appears to admit that the body consists of a multitude of 'organic units,' each of which possesses its own proper attributes, and is to a certain extent independent of all others;" and it may be safely asserted that the general expression of biological opinion since that date has been emphatically the same. We may therefore rest assured that the hypothesis of organic units, and all that such an hypothesis implies, must lie at the foundation of the science of heredity. It remains to determine further particulars; we have to examine how far the details of such theories as are based upon the hypothesis of organic units are correct, and to consider how their deficiencies may be supplied.

The facts for which a complete theory of heredity must account may conveniently be divided into two groups; the one refers to those inborn or congenital peculiarities that were also congenital in one or more ancestors, the other to those that were not congenital in the ancestors, but were acquired for the first time by one or more of them during their lifetime, owing to some change in the conditions of their life.

The first of these two groups is of predominant importance, in respect to the number of well-ascertained facts that it contains, many of which it is possible to explain, in a broad and general way, by more than one theory based on the hypothesis of organic units. The second group includes much of which the evidence is questionable or difficult of verification, and

and boy; (2) boy and girl; (3) girl and boy; (4) girl and girl. All these events would in the supposition be equally likely, and they give two cases of the same, and two of opposite sexes.

\* This memoir was in type for publication in the December number of the *Contemporary Review*, at the time when it was read before the Anthropological Institute. I have taken the opportunity afforded by a reprint, to revise it considerably, and to amend it in many particulars.—F. G.

† Darwin: "Variation of Plants and Animals under Domestication," ii. 370.

which, as I shall endeavour to show, does not, for the most part, justify the conclusion commonly derived from it. In this memoir I divide the general theory of heredity into two parts, corresponding respectively to these two groups. The first stands by itself, the second is supplementary and subordinate to it.

No theory of heredity has been enunciated with more clearness and fulness than that of Mr. Darwin's Pangenesis, and the preparatory statement to that theory contains the most elaborate epitome that exists, of the many varieties of facts for which a complete theory of heredity must account. What I have now to say, is largely based on the arguments and considerations brought forward by Mr. Darwin in support of Pangenesis; nevertheless the conclusions in this paper will be seen to differ essentially from his own: Pangenesis appears more especially framed to account for the cases which fall in the second of the above-mentioned groups, which are of a less striking and assured character than those in the first group, and it will be seen that I accept the theory of Pangenesis with considerable modification, as a supplementary and subordinate part of a complete theory of heredity, but by no means for the primary and more important part.

Before proceeding, I beg permission to use, in a special sense, the short word "stirp," derived from the Latin *stirpes*, a root, to express the sum-total of the germs, gemmules, or whatever they may be called, which are to be found, according to every theory of organic units, in the newly fertilised ovum—that is, in the earliest pre-embryonic stage—from which time it receives nothing further from its parents, not even from its mother, than mere nutriment.) (It is hardly necessary to remind the reader that not a drop of blood from the mother penetrates into the vessels of the embryo, but that the two circulations are wholly distinct; the placenta to which the embryo is attached, and with which it is in vascular connection, being itself nourished from the mother by mere imbibition.) (This word "stirp," which I shall venture to use, is equally applicable to the contents of buds, and will, I think, be found very convenient, and cannot apparently lead to misapprehension.

The whole of the "stirp," together with much of mere nutriment, is packed into a space not exceeding the size of the head of a pin, for that is about the size of the newly fertilised ovum, which, curiously enough, is the same in all mammalia. It is evident that direct observation can tell us nothing concerning the form and behaviour of such minute objects as the germs of which the stirp is composed; they would be far beyond the ken of the microscopist, even if their separate

actions upon light were different. But even this is not the case, for the fertilised ovum is almost homogeneous in colour. Ova and their contents are, to biologists looking at them through microscopes, much what mail-bags and the heaps of letters poured out of them are to those who gaze through the glass windows of a post office. Such persons may draw various valuable conclusions as to the postal communications generally, but they cannot read a single word of what the letters contain. All that we may learn concerning the constituents of the stirp must be through inference, and not by direct observation; we are therefore forced to theorise.

We will begin with a statement of the four postulates that seem to be almost necessarily implied by any hypothesis of organic units, and which are included in that of Pangenesis. The first is, that each of the enormous number of quasi-independent units of which the body consists, has a separate origin, or germ. The second is, that the stirp contains a host of germs, much greater in number and variety than the organic units of the bodily structure that is about to be derived from them; so that comparatively few individuals out of the host of germs, achieve development. Thirdly, that the undeveloped germs retain their vitality: that they propagate themselves while still in a latent state, and contribute to form the stirps of the offspring. Fourthly, that organisation wholly depends on the mutual affinities and repulsions of the separate germs; first in their earliest stirpal stage, and subsequently during all the processes of their development.

Proofs of the reasonableness of these postulates are especially to be found in the arguments of Mr. Darwin: that there is at least a fair ground to believe in their reasonableness, may be shown in a cursory manner. Thus, the independent origin of the several parts of the body may be argued from the separate inheritance of their peculiarities. If a child has its father's eyes and its mother's mouth, these two features must have had a separate origin. Now, it is observed that peculiarities, even of a microscopic kind, are transmissible by inheritance, and therefore it may be concluded that the minutest parts of the body have separate origins. That the stirp contains a much greater variety of germ, than achieve development is proved by the fact that a person is capable of transmitting a variety of ancestral peculiarities to his children, that he did not himself possess. But since everything that reached him from his ancestors must have been packed in his own stirp, it follows that his stirp contained in addition to such peculiarities as were developed in his own bodily structure, those numerous other ancestral pecu-

liarities of which he was personally destitute, but which he bequeathed to one or more of his descendants. Therefore every stirp must be held to contain a great variety of germs in addition to those that may achieve development in the person who grows out of that stirp. It further follows, that these residual germs retain their vitality, and contribute to form the stirp of the descendants, as will be explained more fully further on. The fourth and last postulate, that organisation wholly depends on the mutual affinities of the separate organic units, commends itself to acceptance by the simplicity and sufficiency of what is asked; much of what I have to say in this paper, will testify to this. We must also bear in mind, that the alternative hypothesis of a general plastic force resembles that of other mystic conceptions current in the early stages of many branches of physical science, all of which yielded to molecular views, as knowledge increased. The science of heredity is still in an early stage, and analogy disposes us to expect that its course will be similar to that of its predecessors. The possibility of such minute objects as the germs possessing sufficient delicacy of perception to ensure that each of so enormous a variety of them should find its place, was illustrated by Mr. Darwin through the delicate perception of the pollen grains of the different species of plants. He says: \* "About 10,000 compositæ exist, and there can be no doubt that if the pollen of all the species could be simultaneously or successively placed on the stigma of any one species, this one would elect, with unerring certainty, its own pollen." The partial failures in the action of these affinities are most instructive, as where a mark of any kind on the skin is transmitted by inheritance in an altered situation, to a neighbouring or to an homologous part. Having stated thus much by way of preface, we may now proceed freely.

(Much wonder is expressed by physiologists at the apparent fact that none, at least of the higher races, admits of being long maintained through any system of unisexual parentage; but that a deterioration, which we may reasonably ascribe to a deficiency of some of the structural elements, is always observed to set in and gradually to increase, the race ultimately perishing from that cause. A system of double parentage is therefore a very important requirement, some think an essential one, to secure the indefinite maintenance of any race whose organisation is complex.) What is the explanation of this? In the first place, double parentage should be looked upon as the primary requirement, and sex as the consequence, not the cause of that requirement. There are not of a necessity two sexes,

\* "Variation of Plants and Animals under Domestication," ii. 380.

because swarms of creatures of the simplest organisations mainly multiply by some process of self-division. On the other hand, as I shall endeavour to show, there is a theoretical advantage in a system of double parentage, which grows to be of paramount importance, as organisations increase in complexity. But it is through the evolution of sex, that a system of double parentage is secured, and, therefore, I would submit, it is to the need of the latter that we must ascribe the existence of the former. The opposite view is certainly erroneous, namely, that sex is an inherent necessity, and that double parentage is the simple consequence of it. Such a sequence, which, perhaps, represents the common and unreasoned theory, is, to use a common phrase, "putting the cart before the horse." As has been just remarked, in many of the lowest forms of organised life, double parentage exists, but sex apparently does not, because any two cells seem able to conjugate and to combine their contents within a single cell; these forms are also capable of easy unisexual multiplication by self-division or by budding. Proceeding higher in the scale of life, the sexual differentiation becomes increasingly marked, and unisexual propagation is of rarer occurrence. At length we reach a stage where the differentiation of sex is complete, and the power of unisexual propagation is wholly lost. (Now the necessity of a system of double parentage in complex organisations, is the immediate consequence of a theory of organic units and germs, as we shall see if we fix our attention upon any one definite series of unisexual descents, and follow out its history. Suppose we select, cut off, and plant the second bud, then after it has grown to maturity we similarly take the second of *its* buds, and so on consecutively. At each successive stage there is always a chance of some one or more of the various species of germs in the stirp dying out, or being omitted; and of course when they are gone they are lost for ever, and are irreplaceable by others. From time to time this chance must fall unfavourably, and will cause a deficiency in some of the structural elements, and a consequent deterioration of the race. If the loss be vital, this particular line of descent will of course be extinguished at once; but on the more favourable supposition, the race will linger on, submitting to successive decrements in its constituent elements, until the accumulation of small losses becomes fatal.) What is true for the series of second buds in our example, is of course equally true for any system we please to specify, and therefore it would be generally true in the experience of gardeners and others.\*

\* It might be worth the while of the mathematical reader to refer to a paper on an analogous subject, "The Extinction of Surnames," by the Rev. H. W. Watson, in the *Journal of the Anthropological Institute*, 1874, p. 138, to which there is a page of preface by myself.



But in a free state of nature, where the weakly plants are supplanted by those that remain sound, a new consideration is introduced. Here we have to consider, on the one hand, the growing chance against the deterioration of each single line of descent, and on the other, the growing number of all possible lines of descent. They both proceed in a geometrical ratio; and if the ratio of the latter exceeded that of the former, extinction need not take place. But, again, this excess would become an impossibility after a certain degree of complexity had been reached, because with growing complexity, the chance of deterioration must increase, while the fecundity (see H. Spencer's 'Biology,' vol. i. "Multiplication") necessarily diminishes. On the other hand, when there are two parents, and therefore a double supply of material, the chance deficiency in the contribution from either of them, of any particular species of germ, tends to be supplied by the other. No doubt, cases must still occur, though much more rarely than before, in which the same species of germ is absent from the contribution of both, and a very small proportion of the families will thereby perish. But what if they do become extinct? The remaining families are perfectly sound, or tend to become so in each succeeding generation, and they fill up, only too easily, the gap. (Thus we see that in any specified course of unisexual generation, every line of descent is doomed to extinction, sooner or later; but that in bisexual, only a very small proportion of families become extinct, or even temporarily suffer, from the cause we are considering, while the great majority do not suffer a whit, and those few who do, tend to become rehabilitated. There is yet another advantage in double parentage, namely, that as the stirp whence the child sprang, can be only half the size of the combined stirps of his two parents, it follows that one half of his possible heritage must have been suppressed. This implies a sharp struggle for place among the competing germs, and the success, as we may infer, of the fitter half of their numerous varieties.)

The limitation of space in the stirp must compel a limitation not only to the number of varieties of each species of germ, but also to the number of individuals in each variety. The knowledge of such a fact is helpful, and appears to be needed, in accounting for the not very large number of subdivisions in which peculiarities are transmitted. I am not now considering cases of the slow loss of some characteristic of a race, which proceeds by minute gradations, and which may be ascribed, at least in part, to a change in the quality of the germs, nor am I now speaking of cases where it is clear that one of two alternative qualities has overpowered the other, but of instances where they are

equipotent and in no way antipathetic. Thus, in the gradual breeding-out of negro blood, we may find the colour of a mulatto to be the half, and that of a quadroon to be the quarter of that of his black ancestors; but as we proceed further, the subdivision becomes very irregular; it does not continue indefinitely in the geometrical series of one-eighth, one-sixteenth, and so on, but it is usually present very obviously, or not at all, until it entirely disappears. There are many more gradations in compound results, as in an expression of the face, because any one of its elementary causes may be present or absent; and as the number of possible combinations or alternatives, among even a few elements, is very great, there must be room for a large number of grades between the complete inheritance of the expression and its total extinction.

(It is certain, from the rapidity of the visible changes in the substance of the newly fertilised ovum, that the germs in the stirp are in eager and restless pursuit of new positions of organic equilibrium, due, as we may suppose, to the unequal rates of development of some of the better nourished germs. We see that segregations occur as much as aggregations, and it is reasonable to suppose that repulsions concur with affinities in producing them. We know nothing as yet of the nature of these repulsions and affinities, but it seems hardly possible to account for the whole state of affairs on the hypothesis of a purely step-by-step development like that proposed in Pangenesis, where B follows A, and C follows B, and so on.) It is difficult to suppose the directions of the mutual influences of the germs to be limited to lines, like those that cause the blood-corpuscles to become attached face to face, in long rouleaux, when coagulation begins; neither can we suppose them limited to planes, like those that govern the harmonious groupings of the flora and fauna on the face of a land left in a state of nature; but we ought rather to expect them to act on many sides, in a space of three dimensions, just as the personal likings and dislikings of an individual in a flying swarm may be supposed to determine the position that he occupies in it. (Each germ has many neighbours: a sphere surrounded by other spheres of equal sizes, like a cannon ball in the middle of a heap of them, when they are piled in the most compact form, is in immediate contact with no less than twelve others. We may therefore feel assured, that the germs must be affected by numerous forces on all sides, varying with their change of place, and that they must fall into many positions of temporary and transient equilibrium, and undergo a long period of restless unsettlement, before they severally attain the positions for which they are finally best suited. However ignorant we may be

at present of the character of these affinities and repulsions, or of what Mr Herbert Spencer calls their polarities, in his instructive chapters in the first volume of his "Principles of Biology," a conviction of their existence is sufficient to afford general notions of what must be their mode of action, and enables us to illustrate its necessary consequences by many familiar experiences. Chief among these are the events of political life, such as those connected with the struggle for place and power, with election, and with representation. We know that the primary cells divide and subdivide, and we may justly compare each successive segmentation to the division of a political assemblage into parties, having, thenceforward, different attributes. We may compare the stirp to a nation and those among its germs that achieve development, to the foremost men of that nation who succeed in becoming its representatives; lastly, we may compare the characteristics of the person whose bodily structure consists of the developed germs, to those of the house of representatives of the nation. These are not idle metaphors, but strict analogies; they will be found to bear consideration, and to be worthy of being pursued, as they give a much-needed clearness to views on heredity.

The great dissimilarity frequently observed between brothers or sisters is to be accounted for and easily illustrated by a political metaphor. We have to recognise, on the one hand, that the stirps of the brothers and sisters must have been nearly alike, because the germs are simple organisms, and all such organisms breed true to their kind, and on the other hand, that very different structures have been developed out of those stirps. A strict analogy and explanation of all this is afforded by the well-known conditions and uncertainties of political elections. We have abundant experience that when a constituency is very varied, trifling circumstances are sufficient to change the balance of parties, and therefore, although there may be little real variation in the electoral body, the change in the character of its political choice at successive elections may be abrupt. A uniform constituency will always elect representatives of a uniform type; and this result precisely corresponds to what is found to occur in animals of pure breed, whose stirp contains only one or a very few varieties of each species of germ, and whose offspring always resemble their parents and one another. The more mongrel the breed, the greater is the variety of the offspring.

In twins of the same sex a dissimilarity is not unfrequently found of a more marked description than that between ordinary brothers and sisters, notwithstanding that the embryonic conditions of the twins must have been closely similar. This is a very

curious subject, and requires the following explanation. I had occasion to make many inquiries into the resemblances of twins; whence it appeared that among well-formed "true" twins,\* so to speak, namely, those who, up to the time of their birth, were enclosed in the same membrane, and had therefore been developed out of two germinal spots in the same ovum, there exist two groups of cases that contrast strangely with one another, while there are, comparatively speaking, only a few intermediate cases. In the larger of the two groups, the twins are exceedingly alike in body and mind; also in their growth, illnesses, and decay, and their resemblance is not unfrequently such as to justify the somewhat startling incidents referring to twins, that are to be found in many works of fiction. In the smaller group, which contains perhaps one-fourth as many cases as the larger, the twins are absolutely unlike; so much so, that they have occasionally been described as "complementary" the one to the other—the one having what the other lacked. What can be the reason that, out of identically the same primary stirp, either two absolutely dissimilar persons can be developed, or else two closely similar ones; while the intermediate cases are comparatively rare, so that they may be considered due to quite another and more common contingency—namely, that in which the twins are not produced out of the same ovum, but from separate ova? The answer I suggest is as follows:—As regards the similarity of true twins, there can be little difficulty; we should expect, on statistical grounds, that the two halves of any assemblage of germs would be much alike. The secondary stirps of the twins being alike, and the circumstances under which the bodily structure is developed out of them being almost identical, the results must be closely similar. On the other hand, as regards the dissimilarity, we might expect that if there had happened to be a sufficient delay before the division of the primary stirp, to allow its germs to arrange themselves somewhat according to their affinities, the twin halves of the primary stirp would be strongly contrasted. Political analogies may again be appealed to with advantage. In the case of an ordinary single birth, each germ that achieves development may be compared to the sole representative of a body of electors.

\* For some general results of these inquiries, see the paper printed in the *miscellanies* of this volume. I had twenty cases of strong dissimilarity in twins, and in all the cases the twins were of the same sex. Now it appears to be a rule without exception that what I have above termed "true" twins are of the same sex. Such twins are by no means uncommon; Späeth's estimate of their frequency, as compared to that of twin births generally, is as high as 25 per cent., and I understand that his observations rank among the very best; however, the estimates of other observers are much lower. Hence there is much probability that my cases of strong dissimilarity were usually, if not invariably, cases of true twins. But I have no direct evidence one way or the other.

each of whom has a single vote; then, in the case of twins, two representatives have to be elected, each elector still having only a single vote. If one of the political parties slightly predominates, and if the electoral body be divided by an accidental line, the same party would predominate in each division; consequently if the election happened to be so conducted, both representatives would be men of the same predominant party, and of identical politics. But if the electoral body acted as a whole, the predominating party would be unable to return more than a single candidate; consequently the two representatives would be men of opposite politics.

Individual variation depends upon two factors; the one, is the variability of the germ and of its progeny; the other, is that of all kinds of external circumstances, in determining which out of many competing germs, of nearly equal suitability, shall be the one that becomes developed. The variability of germs under changed conditions, and that of their progeny, may be small, but it is indubitable; absolute uniformity being scarcely conceivable in the condition and growth, and, therefore, in the reproduction of any organism.) The law of heredity goes no further than to say, that like *tends* to produce like; the tendency may be very strong, but it cannot be absolute. The effect of the second of the factors mentioned above, is that a very slight variation in the germs may have a momentous effect in the personal structure that is developed out of a comparatively small number of them. There are numerous competing germs in the place of each unit of structure, and only one of the competitors can succeed in each case. When the competition is close, a very slight difference, either in the intrinsic quality of the germ, or in its temporary position at some critical time, or in any other variable circumstance, may determine its success. It may well happen, that some species of germs may have failed in achieving development during very many generations, by the end of which time they may have become considerably modified, and at length, partly owing to their intrinsic improvement, and partly to the accident of favourable circumstances, that species may suddenly vanquish its competitors and achieve development, and be the cause of a marked individual variation. The chain of sequences would have been perfectly continuous, though its manifestation in the form of personal structure would appear strangely capricious. Precisely similar catastrophes are of notoriously frequent occurrence in political and social life.

Those germs which have become developed into cells, have been supposed (I believe universally) to be the important, if not the chief agents in maintaining the progeny of germs; in other



words, of influencing heredity. This is certainly an essential condition in the theory of Pangenesis, as the name of that theory testifies; there, each separate cell in its nascent state is supposed to throw off germs that circulate freely in the body along with the others that had been hereditarily transmitted. It is from among the general mass of these, that certain groups are supposed to aggregate themselves, owing to their mutual affinities, and so to form the sexual elements. For my own part, while acknowledging that there is undeniable evidence of the existence of the power of cells to throw off germs, which will be discussed when we come to the second group of cases, I shall endeavour to show that its effects on inheritance generally, are minute and secondary. My argument is this: Of the two groups of germs, the one consisting of those that succeed in becoming developed, and in forming the bodily structure, and the other consisting of those that remain continually latent, the latter vastly preponderates in number. We should expect the latent germs to exercise a corresponding predominance in matters of heredity, unless it can be shown that, on the whole, the germ that is developed into a cell, becomes thereby more fertile than if it had remained latent. But the evidence points the other way. It appears both that the period of fertility is shorter, and the fecundity even during that period is less in the germ that becomes developed into a cell, than they are in the germ that remains latent. ) Much less then would the entire bodily structure, which consists of a relatively small number of these comparatively sterile units, successfully compete in matters of heredity with the total effect of the much more numerous and more prolific units which are in a latent form. The shortness of the period of fertility of the germ that becomes developed, is implicitly acknowledged even by the author of Pangenesis, who considers it to cease so soon as the cell is completely formed (*op. cit.* ii. 374), and the hypothesis that the developed germ is less fecund, even during its short period of fertility, than the germ that continues latent, agrees singularly well with many classes of fact. Thus it explains why, although hereditary resemblance is the general rule, the offspring is frequently deficient in the very peculiarity for which the parent was exceptionally remarkable. We can easily understand that the dominant characters in the stirp will, on the whole, be faithfully represented in the structure of the person who is developed out of it; but if the personal structure be a faithful representative of the dominant germs, it must be an over-favourable representative of the germs generally, and therefore, *a fortiori*, of the undeveloped residue; nay, in extreme cases, the personal elements may be absolutely misrepresentative of the residual

elements, the accidental richness of the sterile sample in some particular valuable variety of germ, having drained the fertile residue of every germ of that variety. The possibility of this occurrence is the more credible, since, as we have already seen, the number of germs of each variety cannot be very large. Experience testifies to the fact that children of men of extraordinary genius have not unfrequently been singularly deficient in ability, and this condition has been especially remarked in instances where the man of genius was himself the offspring of a mediocre ancestry; where, therefore, according to the above theory, the number of valuable germs were few, and all of them were used up and rendered comparatively sterile in the structure of his own person. The steady tendency to deterioration in exceptional peculiarities is likewise shown by the avowed difficulty, among breeders, of maintaining the high character of any valuable variety that has been produced by accident (that is, by some happy combination of a number of unknown variable causes). Another result of the best elements of the stirp being rendered sterile, is the strong tendency to deterioration in the transmission of every exceptionally gifted race. That this is a universal tendency among races in a state of nature, is proved by the fact that existing races are only kept at their present level by the severe action of selection. If they were left unpruned even for a single generation, the weaker members would survive, and the average quality of the race would necessarily diminish.

Again, the sterility of the developed elements of the stirp explains the fact of certain diseases skipping one or more generations, if the further very reasonable postulates are granted, that the germs of those diseases are both prolific and gregarious. Thus, nearly all the gout molecules in the stirp whence A sprang might, owing to their gregarious nature, become developed in the person of A, and so be rendered sterile; the small fertile residue in his stirp would be insufficient to supply that of his son B with enough gout germs to dominate and achieve development in the person of B, consequently they would be husbanded; then, owing to their prolific character, they would so multiply in a latent form in the structure of B, as to insure transmission in sufficient numbers to the stirp of C the son, or D the grandson, to enable them to achieve development in the person of C or D, just as they had done in that of A; and so the cycle would be repeated.

(The conclusion from what has thus far been said is amply confirmed by observation; it is:—1. That the contents of the stirp must segregate themselves into divisions or septs, and that these septs must subdivide again and again, under the influence

of the mutual attractions and repulsions of their units, just as a large political party may repeatedly subdivide itself into different factions. (2.) That the dominant germs in each successive sept are those that achieve development. (3.) That it is the residual germs that are the parents of the sexual elements or buds.)

No process of subdivision like that which has just been described could be expected to take place with perfect accuracy; no political party was ever split with such clean precision into two political septs, that none of the A party were included in the ranks of B, and *vice versa*. We must therefore feel assured that germs of many alien species would be included in each successive sept. Also, we may reasonably suppose that the structure formed out of those germs that have developed into cells, must afford many convenient places for the lodgment and sustenance of the alien germs; consequently, representatives of all parts of the residue of the stirp would be found dispersed all over the body. Lastly, we cannot but expect that these alien germs, when they thrive and multiply, would somewhat transgress the bounds of the cell or cell-interspace in which their progenitors had lodged, knowing that even so large an object as a blood-corpuscle will occasionally find its way through the unruptured wall of a capillary vessel. (This is a very different supposition to that of the free circulation of gemmules in Pangenesis, yet it seems to have the merits of that theory (so far as the group of cases are concerned which we are now considering, namely, the inheritance of qualities that were congenital in the ancestry), and at the same time to be free from the many objections that are urged against the theory of Pangenesis. These are as follows:—On physical grounds, we cannot understand how colloid bodies, such as the Pangenetic gemmules must be, could pass freely through membranes. Moreover, if they did, the paternal gemmules in the body of the unborn child would diffuse themselves equally over the body of the child and that of its mother; consequently there would be very few remaining in the body of the child, while, on the other hand, there would be an invasion of maternal gemmules.) The final result of this would be, that the individual would transmit his or her maternal peculiarities far more than his or her paternal ones; in other words, people would resemble their maternal grandmothers very much more than their other grandparents, which is not at all the case.) That the gemmules are not contained, in any large number, in the blood-vessels, is proved by my own experiments, in which I largely transfused the blood of an alien species of rabbit into the blood-vessels of male and female silver-grey rabbits, from which I afterwards bred. I repeated this process

for three generations, and found not the slightest sign of any deterioration in the purity of the silver-grey breed.\*

Again, a free circulation of the gemmules, such as Pangenesis supposes, would cause various events to be extremely common, whereas the supposition of their transgression through a small space beyond their original limits, shows them to be possible, though infrequent, just as they actually are. I mean such cases as the zebra-marks on the foal out of a thoroughbred mare by a thoroughbred horse, owing to the former having once borne a mule to a zebra; the action of pollen on the tissues adjacent to the fertilised pistil of a different variety of plant. The distribution of the germs, by the agency I supposed, all over the body, would account equally with Pangenesis for the replacement of a lost limb in the lower animals, and the reparation of simple tissues in the higher ones. It would much transcend my limits if I were to enter at length into these and kindred questions; but it is not necessary to do so, for it is sufficient to refer to Mr. Darwin's work, as already quoted, where they are most fully and carefully discussed, and to consider, while reading it, whether the theory I have proposed could, as I think it might, be substituted with advantage for that of Pangenesis. I must repeat, that I limit these remarks to the very large proportion of cases that fall into the first of the two groups, in which I am discussing the facts of heredity.

It will be convenient at this place to contrast the views that have been thus far set forth with those of Mr. Darwin in his theory of Pangenesis. That theory affirms as follows:—

- (1.) There are cells, and there are a great number of gemmules.
- (2.) The cells multiply by self-division, and during this process they throw off gemmules. [I look upon this process of throwing off gemmules to be of such minor importance as to have no effect whatever upon the cases we have thus far considered. Its existence is granted, but only as a subordinate process, to account for the exceptional cases to be hereafter considered, and not as the primary process in heredity.]
- (3.) The gemmules multiply by self-division, and any gemmule admits, under favourable circumstances, of being developed into a cell. [I look upon this as the primary process in heredity.]
- (4.) The personal structure is formed by a process analogous to the fertilisation of each gemmule that becomes developed

\* The experiments on the first generation were published Proc. Royal Society, 1871, p. 393; but see Mr. Darwin's remarks in *Nature*, 1871, p. 502, as to my conclusions. I subsequently carried on the experiments with improved apparatus, and on an equally large scale, for two more generations.

into a cell, by means of the partially developed cell that has preceded it in the regular order of growth. [I look on it as due, first, to the successive segmentations of the host of gemmules that are contained in the newly fertilised ovum, owing to their mutual affinities and repulsions; and, secondly, to the development of the dominant or representative gemmules in each segmentation, the others remaining dormant, and are called, for convenience, in the next paragraph, the "residue."

(5.) The sexual elements are formed by aggregations out of the gemmules, all of which are supposed to travel freely throughout the body. [I look on the sexual elements as directly descended from the "residue," and do not suppose the gemmules to travel freely. I allow some very moderate transgression across the bounds of their domiciles, and something more than that, under the limitations that will be described in the latter part of this memoir.]

[I account for all varieties of the gemmules being found in all parts of the body, by the above-mentioned segmentations being never clean and precise. Hence it follows that each segmentation must contain stray and alien gemmules, and I suppose that many of these become entangled and find lodgment in the tissue developed out of each segmentation.]

We will next proceed to examine the cases that fall into the second group; they are those in which characters created artificially in the person of the parents, are transmitted by inheritance to their offspring. In considering what appear at first sight to be cases in evidence of this, we must be extremely careful not to confuse the effects of totally different processes.

We have thus far dealt with three agents—(1) the stirp, which is an organised aggregate of a host of germs; (2) the personal structure, developed out of a small portion of those germs; and (3) the sexual elements, generated by the residuum of the stirp. The cases before us are those which are supposed to prove that 2 reacts on 3—that is, the personal structure upon the sexual elements. The first and the largest class of these cases refer to adaptivity of race. It is said that the structure of an animal changes when he is placed under changed conditions; that his offspring inherit some of his change; and that they vary still further on their own account, in the same direction, and so on through successive generations, until a notable change in the congenital characteristics of the race has been effected. Hence, it is concluded that a change in the personal structure has reacted on the sexual elements. For my part, I object to so general a conclusion for the following reasons. It is universally admitted that the primary agents in the processes of growth, nutrition, and reproduction are the same, and that a



true theory of heredity must so regard them. In other words, they are all due to the development of the same germinal matter, variously located. Consequently, when similar germinal matter is everywhere affected by the same conditions, we should expect that it would be everywhere affected in the same way. The particular kind of germ whence the hair sprang, that was induced to throw out a new variety in the cells nearest to the surface of the body under certain changed conditions of climate and food, might be expected to throw out a similar variety in the sexual elements at the same time. The changes in the germs would everywhere be collateral, although the moments when any of the changed germs happened to receive their development, might be different. So far from there being evidence that the changed structure of the hair causes the germs in the sexual organs to vary, it may often happen that the latter are the first to change. Thus the progeny of thick-fleeced sheep, newly imported into the tropics, may begin to lose wool earlier than their parents. There is not a shadow of proof that the adaptivity of a race to changed conditions, *affecting all parts of the body alike*, is due to the reaction of changed personal structure upon the sexual elements. Another instance of simultaneous action is to be found in the fact that a drunkard is often known to have imbecile children, although his offspring previous to his taking to drink were healthy. The alcohol pervades his tissues, and, of course, affects the germinal matter in the sexual elements as much as it does that in the cells which form the structure of his own nerves. Exactly the same result must occur in the case of many constitutional diseases that have been acquired by long-continued irregular habits. The case is different as regards those conditions that have a local influence; but races are very slow in adapting themselves to these.

Another class of evidence brought forward in proof of the inheritance of non-congenital peculiarities concerns mutilations. No doubt the industry of M. Prosper Lucas, and of many others, has brought together several curious cases; but the negative evidence, that is to say, the certainty of the non-inheritance of mutilations in a vast number of cases (see Darwin: "Variation of Plants and Animals under Domestication," ii. 23), is so overpowering, that it may still be reasonable to look upon the former as no more than a collection of coincidences. The earliest instance that I know of, that seems worthy of serious consideration, is that of Dr. Brown-Séquard's epileptic guinea-pigs, because it admits of verification; but this, if I understand his account rightly (Proceedings of Royal Society, x. 297), is open to some objection. It appears that Dr. Brown-Séquard found, during his researches into the cause of epilepsy, that, by

a particular operation on the spinal cords of guinea-pigs, he could induce a convulsive disease very much like epilepsy. He operated upon many guinea-pigs, and kept them apparently apart from the rest of his stock, and noticed that their young were at times attacked with "epileptiform" convulsions, while the young of the rest of his stock never were; hence he concludes that the artificially induced epilepsy was transmitted hereditarily. My objection to this conclusion is, that if persons were brought up from childhood in a ward of epileptic patients, they would certainly acquire a tendency to epileptiform seizures by the mere effect of imitation. It is notorious that many an epileptic person has had his fits first brought on by witnessing the epileptic seizure of another. This, however, may be an unfounded objection, due, as has just been remarked, to misapprehension of an experiment, whose details deserve a fuller description. It is much to be regretted, that two subsequent memoirs, read by Dr. Brown-Séquard at the British Association in 1870, do not appear to have been published; their titles only are to be found in its *Journal* (p. 134). But he has communicated a most important *résumé* of other results to the *Lancet* (Jan. 1875, p. 7) regarding the inheritance of certain purely physical effects that were produced on the parent guinea-pigs by nerve-mutilation, and their occurrence in the offspring, in the same order in which they had appeared in the parents.

A special cause may be assigned for the effects of disuse in causing hereditary atrophy of the disused parts. It has already been shown that all exceptionally developed organs tend to deteriorate; consequently those that are not protected by selection will dwindle. The level of muscular efficiency in the wing of a strongly flying bird is like the level of water in the leaky vessel of a Danaid, only secured to the race by constant effort, so to speak; let the effort be relaxed ever so little, and the level immediately falls.

In addition to much else that might be said in disparagement of evidence on which overmuch reliance has hitherto been put, we should recollect that it is hazardous to adduce the very gradual adaptation of a race to changed conditions as a proof that acquired habits are hereditarily transmitted, because when several generations elapse before any appreciable result can be observed, selection will have had many opportunities of operating. It is indeed hard to find evidence of the power of the personal structure to react upon the sexual elements that is not open to serious objection. That which appears the most trustworthy, lies almost wholly in the direction of nerve changes, as shown by the inherited habits of tameness, pointing in dogs, and the like, and the results of Brown-Séquard.

The conclusion to be drawn from the foregoing arguments is, that we might almost reserve our belief that the structural cells can react on the sexual elements at all, and we may be confident that at the most they do so in a very faint degree; in other words, that acquired modifications are barely, if at all, *inherited*, in the correct sense of that word. If they were not heritable, then the second group of cases would vanish, and we should be absolved from all further trouble about them; but if they exist, in however faint a degree, a complete theory of heredity must account for them. I propose, as already stated, to accept the supposition of their being faintly heritable, and to account for them by a modification of Pangenesis. Each cell may be supposed to throw off a few germs that find their way into the circulation, and thereby to acquire a chance of occasionally finding their way to the sexual elements, and of becoming naturalised among them.) In illustration of this process, we may recur to political metaphor, and imagine the stirp to be represented by some country, and the germs by its inhabitants. We know that, in every country, travellers from other nations occasionally find a place, which they can fill more suitably than at their own homes or elsewhere, and they become settlers. The population of the country may be as highly organised as it is needful to consider the sexual elements to be; every trade and profession may seem to be full; and yet the stranger obtains a lodgment, either through superiority or luck. He may displace one of the native-born inhabitants, or he may find an unoccupied corner which he can fill; anyhow, as a matter of fact, he becomes a permanent citizen.

The hypothesis of organic units enables us to specify with much clearness the curiously circuitous relation which connects the offspring with its parents.\* The idea of its being one of direct descent, in the common acceptation of that vague phrase, is wholly untenable, and is the chief cause why most persons seem perplexed at the appearance of capriciousness in hereditary transmission. The stirp of the child may be considered to have descended directly from a part of the stirps of each of its parents, but then the personal structure of the child is no more than an imperfect representation of his own stirp, and the personal structure of each of the parents is no more than an imperfect representation of each of their own stirps. The political analogy to the common, but false, idea of the filial relationship is that which connects colonists to their parent nations: the relationship, according to the views in this memoir, is much more circuitous and feeble; it resembles that which connects the *representative government* of the colony with

\* I endeavoured to explain this in a paper, Proc. Royal Soc., 1872, p. 394.

the *representative governments* of the parent nations. This, at least, is a first approximation: the second approximation consists in making allowance for the small power that exists, of transmitting acquired peculiarities; that is, for the power of the personal structure to react upon the sexual elements, and thereby upon the future stirp. To effect this, the analogy may be revised by supposing the governments of the parent states to have the power of nominating a certain proportion of the colonists.

It now remains to summarise briefly. I began by showing that certain postulates were admitted by most biologists, and that they gave a firm base whereon to develope a theory of heredity. By these, and by what appear to be their necessary consequences, I explained the object of double parentage, and therefore of sex. Then I dwelt on the restless movements of the germs in the stirp and the variety of their attractions and repulsions. Next I explained how it arose, that brothers or sisters were often very dissimilar; also, on other grounds, why twins derived from the same primary stirp were either very much alike or extraordinarily contrasted (this being a fact that had resulted from inquiries of my own). Then, I spoke of individual variation. Then, I argued that the developed part of the stirp was almost sterile, and that it was from the undeveloped residue that the sexual elements were derived. By this, I explained the almost complete non-transmission of acquired modifications; also the occasional deficiency in the offspring, of qualities for which the parent had been exceptionally remarkable, and for certain diseases skipping alternate generations. The theory was proposed that the successive segmentations of the stirp were not perfectly clean and precise, but that each structure included many alien germs, whereby the progeny of all the contents of the residue of the stirp were distributed over the body. This accounted for much that Pangenesis over-accounted for, and was free from objections raised against the latter.

The assumed evidence that structural changes reacted on the sexual elements was then discussed, and it was pointed out that certain changes were really collateral which had been commonly thought to be effected by inheritance. Some of the evidence that structural changes might react on the sexual elements was, however, accepted, and to account for its existence, a modification of Pangenesis was adopted; each nascent cell being supposed to throw off germs which occasionally found their way into the circulation, and ultimately obtained a lodgment in the already constituted sexual elements; this process being therefore independent of and subordinate to the causes which

were supposed mainly to govern heredity. Finally, the exact relationship was defined, which connects the parents with their offspring.

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Mr. Rudler read a report on Anthropology at Bristol, as follows :—

REPORT on the DEPARTMENT of ANTHROPOLOGY at the BRISTOL MEETING of the BRITISH ASSOCIATION for the ADVANCEMENT of SCIENCE, 1875. By F. W. RUDLER, Secretary of the Department.

THOSE of our members who were present at the Bristol Meeting may fairly look back with unmixed feelings of satisfaction at the part which their science played on that occasion. Year after year the claims of anthropology to take rank among the natural-history sciences come to be better understood and more definitely recognised; and although it is perhaps scarcely possible to altogether exclude papers of an empirical character, it is yet matter of congratulation that there is a notable increase in the number of communications by men who are competent to apply strictly scientific methods to the discussion of anthropological problems. But whilst a large proportion of the papers read at Bristol were undoubtedly of sterling value, and, therefore, sufficient to ensure success at any meeting, no one could shut his eyes to the fact that the exceptional success of the Bristol gathering was traceable to the admirable way in which the proceedings were conducted by the distinguished chairman. In Professor Rolleston, the anthropologists found a leader who, while coupling profound science with masterly scholarship, displayed rare tact in the management of a meeting. The general body of members of the Association is not slow in learning where the greatest attractions are to be found, and hence the audience which gathered in Professor Rolleston's department soon grew too large even for the fine room at the Royal Hotel which had been placed at our disposal. Indeed, so strong and popular were the anthropologists at Bristol, that it was suggested by the president of the Section that the time was come when anthropology should cease to hold the dependent position of a department, and should be raised to the rank of a separate section. Although this suggestion might appear on the face of it to be advantageous to our science, it was decided, after mature discussion in committee, that it would be inexpedient to recommend action in this direction. In fact it was felt that the scientific position of anthropology would be best insured by retaining its association with the older biological sciences, and that, if severed from these, there might be danger of reversion



to its pre-scientific stage. But although it was thus believed that the interests of anthropology would be best served by allowing it to retain, for some time to come, its dependence on the collateral sciences, the discussion was not allowed to close without benefit to our department; and a scheme of recommendations for facilitating its future management was drawn up by Mr. John Evans. It has been found in the practical working of the department that the committee is greatly hampered by its complete subordination to the committee of the Section. After the business which is supposed to be common to the three departments has been transacted, the time left to the sub-committee is too limited for its special work, and, consequently, the merits of the papers presented are often insufficiently discussed. Greater freedom of action has, therefore, been conceded to the sub-committee, which will, in future, be solely responsible for the internal working of the department, the sectional committee being consulted only on questions involving grants of money.

This allusion to financial matters may be fitly followed by a reference to the liberal way in which the committee of recommendations showed itself willing to forward anthropological investigations. Indeed, no fewer than five grants, involving the disposal of £350, were made on this occasion for researches bearing upon anthropology. The committee for preparing and publishing instructions to travellers was re-appointed, with Colonel Lane Fox as secretary, and a grant of £25 was made for additional expenses to be incurred in the issue of an appendix; but it should be mentioned that an almost equivalent sum will be paid to the treasurer of the association as profit on the sale of this work, and that this sum will of course be increased as the sale extends, so that eventually the work may cover its own expenses. It may be remarked in passing that the value of this volume was so fully recognised by the sectional committee that Dr. Sclater, the president, expressed a wish that a similar body of instructions might be drawn up by zoologists for the guidance of travellers willing to assist in their branch of natural history.

It is satisfactory to state that a committee has been appointed for purposes of Prehistoric Archaeology, with Colonel Lane Fox as secretary, and with a grant of £25. Bearing in mind the interesting results which have recently been obtained by our president at Cissbury, there is full assurance that the grant will be profitably applied, and it is to be hoped that it will only be the forerunner of more important grants for like purposes.

The committee for exploring Kent's Cavern was re-appointed, with Mr. Pengelly as secretary, and its grant of £100 was

renewed. Although this grant goes to the account of the geological section, the anthropologists share largely in the benefit of the results, and Mr. Pengelly at the recent meeting was good enough to bring his latest researches before our department.

In like manner the Settle Caves Exploration Committee was re-appointed, with Mr. Tiddeman as secretary, and the annual grant of £50 was this year raised to £100. It is worthy of note that last year's exploration of the Victoria Cave has been unusually successful, and has yielded a remarkable collection of organic remains, which Professor Busk has described. Mr. Tiddeman concluded his report with a reference to the evidence which the cave has yielded as to the probable existence of man in Yorkshire prior to the glacial period.

In the Statistical Section, Anthropology found sufficient supporters to secure the appointment of an Anthropometric Committee, which appears to have been the direct issue of the suggestions which Dr. Beddoe made in a paper read to this Section "On the Physical Characteristics of Englishmen." The specific object of the committee, which is aided by a grant of £100, is the collection of systematic observations of the heights, weights, and other physical characters of the inhabitants of the British Isles. When it is said that Mr. Francis Galton has undertaken the secretaryship, it is unnecessary to add that valuable scientific results may be fairly expected from the labours of this committee.

In reviewing the public proceedings of the department, the first place should undoubtedly be assigned to Professor Rolleston's Address, although this was not delivered until the second day of the meeting. As it is not the practice of the Institute to print the British Association address in its Journal, it may perhaps be allowable to refer to it in this place at greater length than to any of the other communications to the department.

After some introductory observations, Professor Rolleston enumerated a few of the papers which would be submitted to the department, and in doing so was led to touch on the question of "the possibility of rescuing the inhabitants of Polynesia from that gradual sliding into extinction which some writers appear to acquiesce in as the natural fate of such races." Of this question he took a most encouraging view, looking hopefully to the future of the native races, and dropping meanwhile a cheering word to the missionary in his efforts to civilise. By quotation from Dr. Gerland, he showed that the Polynesian populations are not now suffering as rapid a decrease as in the first half of this century, and that in some localities the indigenous population is not only not diminishing, but is actually on the increase; facts which are supported by the authority of the Rev.

A. W. Murray and other residents in Polynesia. In criticising Mr. Bagehot's assertion, "that savages did not formerly waste away before the classical nations, as they do now before the modern civilised nations," Professor Rolleston reminded us that it was extremely unsafe to affirm the non-existence of a thing from the fact that we find no reference to it by contemporary writers. A citation, however, from the Book of Job, descriptive of a perishing barbarian race, was held to prove that savages must have wasted away, even at the early date of this writing.

"There is no need," says Professor Rolleston, "with such actual *veræ causæ* at hand, to postulate the working of any 'mysterious' agency, any inscrutable poisonous action 'of the breath of' civilisation. What is mysterious to me is not civilisation, but the fact that people who are in relation with it do not act up to its behests. And what is the mystery to me is not how an epidemic can, when introduced amongst helpless Polynesians, work havoc, but how it is that epidemics should be allowed to do so here in England from time to time."

Turning to the subjects of craniology and craniography, the President referred to the two opposite views which are taken of the ethnological value of skull-measuring, and pointed out what he conceived to be the true limits of this branch of inquiry. He condemned the rashness of founding ethnical conclusions on the examination of one or two skulls, and dilated on the difficulties of craniographical researches, when directed to the examination of mixed races.

"The largest result which craniometry and cubage of skulls have attained is, to my thinking," says Professor Rolleston, "the demonstration of the following facts, viz. :—first, that the cubical contents of many skulls from the earliest sepultures from which we have any skulls at all, are larger considerably than the average cubical contents of modern European skulls; and secondly, that the female skulls of those times did not contrast to that disadvantage with the skulls of their male contemporaries which the average female skulls of modern days do, when subjected to a similar comparison.\* Dr. Thurnam demonstrated the former of these facts, as regards the skulls from the Long and the Round Barrows of Wiltshire, in the 'Memoirs of the London Anthropological Society' for 1865; and the names of Les Eyzies and Cro-Magnon, and of the Caverne de l'Homme Mort, to which we may add that of Solutré, remind us that the first of these facts has been confirmed, and

\* "The subequality of the male and female skulls in the less civilised of modern races was pointed out as long ago as 1845, by Retzius in Müller's 'Archiv,' p. 89, and was commented upon by Huschke, of Jena, in his *Schädel, Hirn, und Seele*, pp. 48-51, in 1854."

the second both indicated and abundantly commented upon by M. Broca."

In explanation of the first of these two conclusions the President remarked that the oldest skulls with which we are acquainted are probably those of the chiefs of their tribes, and that the chiefs may have been elected to their position by virtue of their superior energy and ability. The greater brain-capacity of the chiefs may be further connected with their improved nutrition, since they generally obtain a larger share of food and material comforts than persons of ordinary rank.

With reference to the subequality of the skulls in the two sexes in prehistoric times, Prof. Rolleston cited Broca's explanation, which refers it partly to the greater severity of the struggle for existence, and partly to the less degree to which the principle of division of labour was carried out in those days. "This," says the President, "is an adequate explanation of the facts; but to the facts as already stated, I can add from my own experience the fact that though the female skulls of prehistoric times are often, they are not always equal, or nearly, to those of the male sex of those times; and, secondly, that whatever the relative size of the head, the limbs and trunk of the female portion of those tribes were, as is still the case with modern savages, very usually disproportionately smaller than those of the male."

After expressing his belief that the modern doctrine of "occipital dolichocephaly" will not bear the test of criticism, and duly rendering reasons for such belief, Prof. Rolleston enumerated some of the recent memoirs on craniology, and offered tribute to the memory of Pritchard, "the father of modern anthropology," a tribute which was peculiarly graceful in the city of Bristol, and which formed the text of some remarks by Dr. Carpenter at the conclusion of the address. A reference to the improved status of archæology, which, by its adoption of natural-history methods, is passing to the rank of a science, led Prof. Rolleston to his concluding remarks, in which he dwelt on "the possible curative application of some of the leading principles of modern anthropology to some of the prevalent errors of the day." Did space permit, it would be well to transfer the fine closing passages to these pages, but even this transference would fail to convey the effect which their brilliant delivery produced, and which was well acknowledged in the remarks of Mr. John Evans and Col. Lane Fox, in proposing and seconding the vote of thanks which the President's address so well merited.

During the five days on which the Anthropological Department held its sittings, nearly thirty papers were either read or

taken as read; but it is not the purpose of the reporter to enter into any detailed analysis of this mass of matter. At the present time the Institute is fortunate in possessing a large number of original communications, including several of great value, and it would, therefore, be unjustifiable to occupy the time of the meeting, or the pages of the Journal, with a tedious report on other people's work. In the present case, too, there is the less necessity for this course, as almost all the papers which were of real merit have been secured for the Institute—thanks to the energy of Col. Lane Fox—and will, therefore, be probably read in this room during the present session. Under these circumstances the reporter believes that he will best meet the wishes of the Council, from whom he has received instructions to draw up this report, by limiting his notice of the papers to the briefest possible references.

The proceedings of the department were opened by Mr. Pengelly, who pointed out an error into which Mr. Karr Callard had fallen, with reference to the cast of an implement which he had obtained from the proprietor of Brixham Cavern. It appears that the original was a stone implement from the north of Ireland, and not, as had been asserted, from Brixham. Dr. Beddoe followed with some notes on the ossuary at Rothwell, in Northamptonshire, and expressed his opinion that the bones had been removed at an early date from the churchyard. Mr. Phené discoursed on the works, manners, and customs of the early inhabitants of the Mendip Hills, and illustrated his remarks by some excellent diagrams. In a paper on prehistoric culture in India and Africa, Mr. Hyde Clarke argued in favour of an early community of culture between the two countries, basing his argument on the comparative study of the aboriginal languages of India with those of Africa.

After the delivery of Prof. Rolleston's address on Friday, Miss Buckland read an interesting paper "On Rhabdomancy and Belomancy," in which she sought to trace the origin of divination by means of rods and arrows, and regarded it as a survival of a Turanian or pre-Aryan faith, which might possibly be useful as a test of race. Mr. John Evans explained the international code of symbols which have been prepared for use on archaeological maps by the sub-committee appointed at the Stockholm meeting of the Congress of Prehistoric Archaeology. The results of the recent explorations in Cissbury Camp, which represent the first-fruits of the work of our Exploration Committee, were brought forward by Col. Lane Fox, whilst Prof. Rolleston described the animal remains, including the skeleton of an ancient British lady.

On Saturday morning Mr. Groom Napier read a note on the



localities whence the tin and gold of the Ancients were derived. Then followed several Indian papers, including Sir Walter Elliot's valuable communication on the original localities of the races which form the present population of India. Dr. Leitner discoursed with his usual fluency on the results of his ethnological and linguistic tour in Dardistan, and illustrated his remarks by a number of objects of ethnological interest, including a selection of his Greco-Buddhistic sculptures. Mr. Bertram Hartshorn contributed an original paper on the Veddas, whom he had studied in Ceylon; whilst Mr. Hyde Clarke discussed the Himalayan origin of the Magyar and Finn languages. The Rev. Wyatt Gill spoke briefly on the traditions of the Hervey Islanders—a people with whom he was well acquainted by long residence among them. In the absence of the author, Mr. Robert Mitchell's paper on "The Antiquity and supposed Lost Language of the Kirghiz" was taken as read.

On Monday morning Mr. Pengelly opened the proceedings by an interesting description of the archaeological discoveries in Kent's Cavern. Professor Rolleston then read a short paper on "The Applicability of Historical Evidence to Ethnographical Inquiries," which was fitly followed by Canon Rawlinson's communication on "The Ethnography of the Cimbri," the author arguing in favour of their Celtic origin as stoutly as Mr. Freeman insisted on their Teutonic affinities. Finally, the Rev. Professor Earle read a paper on "The Ethnography of Scotland," in which the Danish element in the Lowland Scots was brought into prominent relief.

On Tuesday, the last day of the meeting, Mr. Mackintosh had a paper on "Anthropology, Sociology, and Nationality." Col. Carrington described the Indians of the North Western United States, delivering his remarks with great effect, and giving some interesting illustrations of gesture-language among these Indians. The Rev. Mr. Gill's note on "The Origin of the South Sea Islanders" was followed by a long memoir by Mr. Vaux on "The Probable Origin of the Maori Race," a subject on which light was thrown by the remarks of Dr. Hector, who is at present in this country. Mr. Park Harrison briefly called attention to his photographs of incised tablets from Easter Island, whilst Dr. Gladstone exhibited a flint flake which he had recently found in the brick-earth pits at Erith, in Kent. As the last day of the meeting was now well advanced, the remaining communications were taken as read. These included a paper by Mr. Wake on "The Predatory Races of Asia and Europe"; one by Mr. Hyde Clarke on "Prehistoric Names of Weapons"; another by Dr. Nicholas on "A New Paragraph in English History"; and finally, one by Mr. Hodder Westropp

on "The Cycle of Development." The proceedings closed with a warm vote of thanks to Professor Rolleston, proposed by Sir W. Elliot, and seconded by Mr. Phené.

Although this terminated the business of the meeting, so far as the Anthropological Department itself was concerned, it may not be out of place to refer to some other ways in which the interests of our science were served at Bristol. Thus it would be ungraceful to omit reference to the handsome volume which had been prepared by the local committee in view of our visit, and was liberally presented to members of the general committee of the Association—a volume which contains a vast amount of trustworthy local information, both historical and scientific, including a chapter on the Anthropology of the district, by Dr. Beddoe. Nor should we omit allusion to the excellent arrangements of the temporary museum, under the care of Mr. J. E. Taylor, in which the objects exhibited at our meeting, such as Col. Fox's instructive model of the Cissbury excavations, might be conveniently examined at leisure.

Advantage was taken of the visit to Bristol by several anthropologists to examine some of the neighbouring prehistoric antiquities. The partial destruction of the old camp of Borough Walls, in Leigh Woods, attracted the attention of Col. Fox, who has since co-operated with Dr. Beddoe with the view of yet preserving a portion of these remains; and it is hoped that their action, supported as it has since been by the Council of the Institute, may successfully compass this end. It is perhaps not travelling beyond the reporter's province to mention that the megalithic remains of Stanton Drew, Avebury and Stonehenge, were included among the places of interest to which excursions had been organised by the local committee. But it may be fairly doubted whether much light was thrown upon prehistoric archaeology by these visits. Indeed our megalithic remains appear to have been rather abused at Bristol. Thus the President of the Association, in his opening address, gave his partial adhesion to Mr. Fergusson's view of the post-Roman origin of many of these monuments; in the official programme of excursions they were all referred to under the popular designation of "Druidical remains"; and in the report of the excursion to Avebury we are told that the reverend gentleman who conducted the party gravely carried the history of the stones "as far as the time of Abraham, when he believed the Avebury pile was in its glory, a period 700 years before the Stonehenge stones had been hewn" (*Western Daily Press*, Sept. 3, 1875). This ascription of our finest megalithic remains to definite dates would hardly need remark, were it not that in certain quarters there is danger of mistaking rashness.

of ignorance for accuracy of knowledge. Such facts show that although so much has of late years been written on this subject, there is yet much need for the dissemination of what we believe to be sounder views—an end which can perhaps be nohow better effected than by a wider circulation of the publications of the Anthropological Institute.

In the discussion which followed the reading of Mr. Galton's papers, Mr. NOYES, Mr. CHARLESWORTH, Dr. RICHARD KING, Professor BUSK, and the PRESIDENT, took part. The PRESIDENT also offered some remarks upon Mr. Rudler's report, and the meeting separated.

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NOVEMBER 23RD, 1875.

Colonel A. LANE FOX, *President, in the Chair.*

The minutes of the previous meeting were confirmed.

The election of J. W. SIMPSON, Esq., of Jaffna, Ceylon, as an ordinary member, was announced.

The list of presents was read and the thanks of the meeting were voted for the same :—

FOR THE LIBRARY.

From the EDITOR.—*Revue Scientifique.* Nos. 20 and 21, 1875.

From the ASSOCIATION.—*Proceedings of the Geologists' Association.* Vol. IV. No. 4.

From the Rev. W. CARRUTHERS.—Photograph of the "Marias," a wild tribe living in the woods and jungle near Chanda, India.

From the SOCIETY.—*Transactions of the Watford Natural History Society.* Vol. I. Part 2.

From the AUTHOR.—*Flint and Chert Implements found in Kent's Cavern, Torquay; Geology and Palaeontology of Devonshire, Part II.; Memoranda, Part I.* By W. Pengelly, F.R.S.

From A. R. WALLACE, Esq.—*The Dierjerie tribe of Australian Aborigines.* By Samuel Gason, Police Trooper.

From the AUTHOR.—*The Indian Tribes and Languages of Costa Rica.* By Wm. M. Gabb.

From the SOCIETY.—*Journal of the Asiatic Society of Bengal, Part I. No. 2.; Proceedings of ditto.* Nos. 7 and 8, 1875.

From the SECRETARY OF STATE FOR INDIA IN COUNCIL.—*Census of the Bombay Presidency, taken on the 21st February, 1872.* Part III.

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The following report was read by the PRESIDENT (A. W. FRANKS, Esq., F.R.S., Vice-President, in the Chair):—

EXCAVATIONS in CISSBURY CAMP, SUSSEX; *being a Report of the*  
 EXPLORATION COMMITTEE *of the ANTHROPOLOGICAL INSTITUTE*  
*for the year 1875.* By Col. A. LANE FOX, President A. I.  
 [With Plates xiv. to xix.]

OUR knowledge of Cissbury and of the ancient Flint Mines associated with it has been, like all other knowledge, a work of slow and gradual development, to which there have been many contributors, each of whom, guided by the archaeological attainments of his age and the experience of his predecessors, has done his best to throw light on the origin and history of this remarkable earthwork. Amongst ancient camps the largest in this part of England, situated on a commanding eminence three miles north of Worthing, on an expanse of down and juniper not yet reclaimed in modern times by the plough, though cultivated in Roman or pre-Roman times, as the terraces on the hill-sides show—visible from the railway and from the surrounding country for some miles, and overlooking within easy signalling distance, if such were needed, the neighbouring camps of Chanktonbury and Highdown—commanding also a continuous view of more than sixty miles of coast stretching out beneath in the form of a bow, as seen from the arrow's point, the white cliffs of Beachy Head and Seaford on the east, the low ground of tertiary formation extending from Brighton and Worthing to Selsea Bill on the west, and the thin spire of Chichester, beyond which may be seen, and of ill-omen when seen, as predicting certain rain on the morrow, the chalk cliffs of Brading, in the Isle of Wight—this place, from these causes, has always been a point of attraction to sight-seers. But it is not until lately, not, I may say, until now, that our excavations have been the means of establishing, by the position of this entrenchment, two distinct points of sequence in the culture of prehistoric man, that it has become one of special interest to anthropologists.

Amongst the earliest of our fellow-workers here may be mentioned no less an antiquary of note than Camden, who, in his "*Britannia*," speaks of this camp as the work of Cissa, the Saxon king of these parts, from whom, in his opinion, and in great probability, it derives its name of Cissbury, but not its origin, as recent discovery has clearly proved. Camden's opinion, although the best of its time, is not of much use to us now. To be nearer in point of time to the subject of inquiry is of no advantage when dealing with matters of such great antiquity; expectation should rather be in an inverse ratio to the time, for each day adds something to the means we have of

finding out the truth in all that relates to the manners and customs of our prehistoric ancestors, if they were our ancestors, which moot point I do not mean to discuss now.

In a paper published seven years ago in the "*Archæologia*,"\* I have endeavoured to do justice to those who wrote on Cissbury during what may be termed the pre-scientific period of archæology, in the days when all knowledge was supposed to be stored up in books, and the art of seeing what there was to be seen had been comparatively little cultivated, and amongst them I have assigned a place of honour to Mr. Irving, not so much on account of anything he found in Cissbury, or of any conclusions that he came to on the subject, but because he was the first to dig into the pits there and record the results of his examination of them, thereby asserting the principle of inquiry by original observation, to which mode of investigation we are indebted for all subsequent discoveries in this place. As, however, Mr. Irving wrote during the pre-scientific, or, in other words, pre-anthropological age of archæology, he took no notice of flints, and it is owing to the existence of a flint implement factory here that Cissbury merits our particular attention at this time.

I may, therefore, omit all special mention of previous investigations, and commence what I have to say with the discovery of this flint implement factory, which was made by myself in the year 1867, and recorded in the paper to which I have referred, and which was read to the Society of Antiquaries in February, 1868.†

If I were asked to select from amongst the discoveries of modern anthropologists the one which appeared to me to have been most fruitful of interesting results, I should select for the post of honour the first discovery of the form and peculiarities of a flint chip, and I would include amongst the contributions to this discovery, firstly, the observations of modern travellers on the mode of working flint implements amongst existing savages, by Catlin and Burton in North America, by Belcher amongst the Esquimaux, and by Bains amongst the Australians. Secondly, the application of the knowledge thus obtained by modern anthropologists, and by Mr. Evans in particular, to the determination, by means of experiment, of those forms and modes of fracture by which we are enabled to recognise at a glance and with certainty, the smallest chip of flint flaked by the hand of man, from those which, split by natural causes, cover the surface of the ground.

\* xlii. p. 53.

† The finding of a single flint celt in Cissbury was recorded in the *Sussex Archæological Collections* some years before, but this led to no further discovery. *Suss. Arc. Coll.*, ii. p. 268.



To our knowledge of flint chips at the present time, and our ignorance of them in the past, we are indebted for the greater part of our prehistoric discoveries. To our ignorance in the past, because it is owing to this ignorance that these chips have been allowed to remain unnoticed and untouched in the very spots in which they were struck off thousands of years ago.

It is by our power of identifying these most abundant relics of primeval man now, that we are led to the spots where further evidence of him may be discovered. By them we know where to look for palæolithic man in the drift gravels, and to determine his place in sequence by the deposits which overlay them. By means of flint chips we can distinguish on the surface of the ground the workshops, the camps, the mines, the villages, and as we cast about the hills we are enabled by means of them, like boys in a paper chase, to hunt up neolithic man in all his old abiding places. All this, be it observed, the modern anthropologist is able to do in places where the antiquary of old could see nothing at all.

As an old sportsman I commend flint hunting to all anthropologists who have not practised it. As a healthy exercise it is fully entitled to a place amongst field sports, and in its objects it is far higher, for whilst the sportsman pushes forward to be in at the death, the goal of the flint hunter is to be in at the birth of a fresh discovery. My discovery of this flint factory, if it was but a little one, was nevertheless a birth, introduced by such pains as a month of continuous walking over the Sussex downs might entitle me to, and for which I considered it an ample reward.

During that month I examined and measured fifteen camps, walked over a considerable area of cultivated ground, and came to the conclusion that the majority of the camps are associated in an especial manner with the existence of flint flakes and other prehistoric flint implements which are found on the surface in the interior of them. Since then my attention has been drawn by Mr. Evans to the fact that a great part of the surface of the chalk cliffs on the coast line between Seaford and Beachy Head is covered with these remains of the prehistoric flint workers, and having walked with him over a great part of this ground, I have been induced to alter my opinion in so far as the two ancient earthworks of Seaford and Beltout are concerned.

In this region the *débris* of flint manufacture is so far abundant on the surface, and especially near the edge of the cliff, that the fact of finding flint flakes in the interior of these entrenchments is no proof whatever of their being of the age of these entrenchments, they may have belonged to the soil on

which the entrenchments were afterwards constructed. But this does not apply to other parts of the Downs of Sussex and elsewhere. There, worked flints are found in patches here and there; but considerable distances may be traversed without coming to these patches, and the fact of finding them in unusual numbers in the insides of these earthworks remains to testify to the probability of their having been used by the inhabitants of them.

Two objections may be raised. It may be said that the insides of the camps have been better searched than other parts, and hence their special association with the flints may be more apparent than real, or it may be said that the same sites were often occupied during successive ages. But these camps are situated on the tops of high hills, in places which, being remote from fuel and water, would not have been occupied except for the purposes of defence. I am therefore still prepared to believe that on further investigation some, though not all of them, will be found to have been erected by people either of the stone age or of some subsequent prehistoric period, during which flint still continued to be used for implements.

In the Camp of Cissbury I found that the number of flint flakes found on the surface were in excess of those found in other camps, such as the Devil's Dyke, Hollingbury, Chanktonbury, Beltout and Seaford, and chiefly in the neighbourhood of a collection of large pits which filled the interior of the camp on the west side. In September, 1867, and again in January, 1868, I excavated a number of these pits, and found in them, at from four to five feet from the surface, a large number of flint tools, the majority of which appeared to be unfinished, but some of which were probably finished specimens. The result of these excavations led me to the following conclusions, which I quote from my paper. After considering the several theories which had been advanced at different times for the use of the pits—such as their being tanks for water, pounds for cattle, or habitations for the men—I said, "For what purpose then were they constructed? I am inclined to think for the purpose of obtaining flints for implements. It is said that the flint is more easily worked when it is first removed from the chalk, and this would be a reason for excavating the pits." The animal remains I found were chiefly those of domesticated species,\* and I attributed the flint factory to the neolithic age; but pointed out that amongst the types of implements found in the pits there

\* The following were identified by Mr. W. Davies, of the British Museum, viz.:—*Cervus elaphus*, *Bos longifrons*, *Capra hircus*, *Equus* (sp. ?) and *Sus scrofa*; no trace of fallow deer. The shells were *Littorina littorea*, *Cyclostoma elegans*, *Tapes decussata*, Linn., *Helix nemoralis*, Linn.

were some which were distinctly allied to palæolithic forms. I also noticed that in the lower parts of the excavations, some of the flints retained the unaltered blue colour of the flint, whilst those found near or upon the surface were whitened by exposure to rain and air.

This was, I believe, the first recorded notice of pits dug for this purpose in this country. Although, as I have since learnt, M. M. C. Malaise had in the previous year, 1866, noticed the existence of ancient pits at Spiennes in Belgium, I was not aware of this at the time of my excavations in Cissbury, and I had not therefore the advantage which his experience would have afforded to guide me in my investigations. To this circumstance it must be attributed that I failed to discover at that time the great extent of these excavations. I was deceived by the hardness of the upper surface of the chalk rubble, consolidated by ages of exposure to moisture from the surface, and led by its close resemblance to the rubble of natural formation, which overlies the chalk everywhere, to suppose that I had reached the bottom when in reality I had, as I afterwards found, only reached in some cases the tops of deep shafts. My reason for assuming that the pits were dug for flints was on account of the great number of flint nodules found in them, which could have come from no other place, and which were mixed with finished and partly finished implements in great abundance, which had obviously been fabricated out of similar nodules. Nor did it appear to me at all necessary to dig deeper for the flints. Some of the pits were as much as 20 feet deep, counting the excavations that I made in them, and there is no superficial deposit of eocene clay above the chalk, which here reaches everywhere to the surface.

In a quarry near Broadwater, where the chalk is on the same, or nearly the same, plain of the middle chalk formation, rising at the same angle northward, the flints are seen in seams at from 3 to 6 feet apart, beginning close to the surface. The Cissbury pits therefore appeared to me quite deep enough to get at them, and this has been confirmed by the most recent of the excavations. The premises therefore were sufficient to justify the conclusion arrived at, although, as will be seen hereafter, I left it for others to discover the extent of the pits and the galleries branching from them. Canon Greenwell also excavated several of these pits in 1868, and with similar results to mine.

In order to continue the history of the discovery of these flint works, it is now necessary to turn to Belgium.

At Spiennes, near Mons, a similar flint factory to that of Cissbury had been noticed as early as 1847, and in 1860 M.

Albert Toilliez described the superficial *débris* of the flint workers, and gave his opinion that they belonged to the surface period, an opinion which, on account of the form of the flint implements, was, I believe, shared by both M. Evans and M. Mortillet. The strata of the soil here, however, differs from that of Cissbury, and throws difficulties in the way of determining the age of the flint works which are not met with at the latter place. The chalk at Spiennes, instead of coming to the surface as at Cissbury, is overlaid by quaternary deposits containing remains of *Elephas primigenius* and *Rhinoceros tichorhinus*, together with flint implements of palæolithic age, and this again by an alluvial deposit (*Limon supérieur*, and *Limon inférieur*). Having ascertained that flint implements were found in the quaternary deposits which rested upon the chalk, M. Malaise, in a paper published in 1866, came to the opinion that the whole of the worked flints found at Spiennes belonged to this quaternary deposit, and stated his belief that they were found on the surface only in those places where, the alluvium being absent, the quaternary deposits cropped out on the surface.

But the true nature of these flint works was only found out gradually, and, like many other discoveries of a similar kind, as the result of accident. Shafts 15 metres deep had been sunk through the superficial deposits into the chalk, and galleries driven from them for the purpose of obtaining flints for a manufactory of Faience close by. Whilst thus employed the workmen came upon other similar shafts and galleries of ancient date, which had been filled up to the top with rubble, and in which many flint implements and some human remains were found.

In two years as many as twenty of these ancient shafts were discovered, and M. Malaise was led by them to the following opinion, with which he concludes his pamphlet.\* “Ces anciens puits, remplis de débris, n’ont ils pas servi à l’extraction des silex bruts dont on a fait ces haches? Les restes humaines n’appartiendraient ils pas aux tailleurs de ces silex?” Still, however, M. Malaise was of opinion that the flint factory was of the palæolithic age, and was anterior to the alluvium. It remained for Messrs. Cornet and Briart to determine the true age of the factory, and again this was brought about through the medium of modern engineering operations.

In constructing a railway from Frameries to Chimay, about the same time that my excavations in Cissbury were going on, a deep cutting 200 metres in length was made through the ground at Spiennes, and twenty-five of these shafts with

\* “Sur les silex ouvrés de Spiennes,” par M. C. Malaise, Bruxelles, 1866.

galleries were cut through. By this means it was seen that the shafts passed upwards through the alluvium and extended to the present surface. This determined the age of the factory to be of the surface-period.

It may be useful to note the most remarkable results obtained by this excavation in order to compare them with those of Cissbury. The shafts were circular, of small diameter, from 0·60m. to 0·80m. across, and filled up to the top with chalk rubble. They were frequently *quite close together*, and often arranged in lines, but whether this was accidental or intended to mark the direction for the galleries beneath, the investigators were unable to determine. The galleries were irregular, from 0·50m. to 2m. high, and from 1m. to 2·50m. broad, running along the seams of flint, and they were partially filled in by hand, and with chalk rubble probably obtained from other pits. The galleries all ran obliquely to the railway cutting, which was east and west, so that a section of them only was seen in the line of the cutting. The greater part of the worked flints were imperfect, but some were perfect; they were found in the shafts, galleries, and on the surface, whilst others of greater antiquity were found, as already said, in the stratified quaternary deposits. Those found on the surface had a white patina over the flaked parts extending to a depth of one millimètre from the surface, and were sometimes coated in addition with a ferruginous oxide. Those found in the stratified quaternary deposits of older date had often a light grey patina, but were never white, whilst those found deep in the shafts and galleries were invariably of the unaltered blue colour of the flint, although in these the fractured portions could easily be distinguished from recent fractures. The flint was of superior quality. A human skull found in one of the shafts was *said to be of large size*. In a seam of charcoal, animal bones, and worked flints, some distance down in one of the shafts, a large fragment of *coarse hand-made pottery* was discovered. The animal remains were those of the hare, rabbit, hedgehog, brown bear, dog (probably domestic), cat, badger, polecat, otter, ox, goat, stag, elk, and wild boar. Implements of deer horn were also found in the shafts. The report of Messrs. Cornet and Briart was published in the "*Bull. Ac. R. Belgique*," and read at Bruxelles on the 1st Feb., 1868.

In 1870 Canon Greenwell examined one of a series of 254 pits, near Brandon, in Norfolk, known as Grimes Graves, the principal results of which were as follows:—The shaft was 39 feet deep, and 28 feet in diameter, the others varied from 20 to 65 feet in diameter, and were at an average of 25 feet apart. The shaft examined was cut through a deposit of 13 feet



of sand overlaying the chalk, and descended until a layer of flint of superior quality, known to modern flint workers as "floor stone," was reached. This layer is still worked for gun flints by means of shafts and galleries of similar form to the ancient ones. The galleries which ran along the seam of flints were from 3 to 5 feet high, and 4 to 7 feet in width, and they communicated with other shafts, forming a complete network of galleries. One of them was 27 feet in length. They were worked out by means of picks of deer horn, as many as seventy-nine of which were found; and also, as Canon Greenwell supposes, by means of flint tools, many of which were found in the excavations. The stag's horns were of larger size than those of the present red deer. All the shafts were filled in to within 4 feet of the surface with the materials from other shafts. Several chalk cups were found, which Canon Greenwell supposed to have been used as lamps. No trace of a polished implement was found anywhere in or about the shafts. No pottery was discovered. Stag's-horn implements were found, some of which had been cut round the surface with a flint, and then snapped off. The sides of the shafts were nearly perpendicular, only narrowing slightly towards the bottom. The people must have ascended and descended by means of ropes or ladders. The animal remains were chiefly those of domesticated animals, and consisted of red deer, small ox, goat or sheep, horse, pig, and dog; and from the form of the implements, Canon Greenwell attributes the whole of the works of Grimes Graves to the neolithic age.\*

About two years ago Mr. Tyndall, of Brighton, following the clue already afforded by previous discoverers, opened one of the pits in Cissbury (L. fig. 1, Pl. xiv.), and having sunk beneath the superficial deposits in search for a shaft, found one 18 feet in diameter at top, narrowing to 10 feet at the bottom, which was 39 feet below the surface. Mr. Tyndall unfortunately died before he could make a proper record of his excavation. He, however, found in the shaft, for the first time in association with this or similar excavations, the remains of the large *Bos primigenius* in considerable quantities, also the wild boar; and the animal remains found in this shaft were, I believe, chiefly those of wild animals.† This circumstance, coupled with the fact now rendered probable, that my previous excavations had been confined to superficial deposits, led some persons to infer somewhat hastily that the whole of the works at Ciss-

\* "Journal of the Ethnological Society of London." New Series. Vol. iii.

† Since then I have learnt from Mr. Boyd Dawkins, F.R.S., who identified these remains, that domesticated species were also found in this shaft. See his remarks at the end of this paper.

bury might be attributed to an earlier period than the neolithic; but this, it will be seen, has not been confirmed by more recent discoveries. Mr. Tyndall's shaft had no galleries leading from it.

Since then Mr. Ernest Willett has opened another shaft (K. fig. 1, Pl. xiv.) near the former one, 19 feet in diameter and 20 feet deep, having galleries at the bottom similar to those of Grimes Graves, a considerable portion of which were re-excavated and examined. Mr. Willett's paper, read to the Society of Antiquaries during the present year, not having as yet been published, I am unable to refer to it in the detail that I could desire. In point of animal remains, the evidence afforded by this excavation appears to have been very bare. Mr. Willett believes that he has ascertained by the existence of hard seams of rubble, evidence of successive periods in the filling in of this shaft. Perhaps the most interesting part of Mr. Willett's discovery consists in the occurrence of several bladebones of a small ox, and the suggestion by him that they were employed as shovels by the prehistoric men. I shall revert to this subject hereafter.

Both Mr. Tyndall's and Mr. Willett's shafts were found in a portion of the works which, though forming part of the same series of pits, were to the south of those examined by me, having been selected, as I understand from Mr. Willett, on account of their having been previously unexplored. Moreover, the depressions on the surface previously to excavation were very shallow, not being more than a foot or two as compared with the basins of 10 to 15 feet which I had examined in the more northerly portion of the series, and their diameters were proportionately small.

Notwithstanding this difference of form—a difference which, as we shall see hereafter, was not confined to the surface—I was led by the discoveries of Mr. Tyndall and Mr. Willett to re-examine some of my previous diggings; and having in June of this year (1875) re-opened one of the large pits explored by me eight years before, and likewise one of those which had been superficially examined by Canon Greenwell in 1868, I found that both extended to a greater depth than we had then supposed.

The general resemblance of the Cissbury flint works to those already described having now been satisfactorily determined, a question of still greater anthropological interest arose in the consideration of the relative age of the neolithic flint factory and the entrenchment in which it is situated. This entrenchment is one of the largest in this part of England. It has, as I have elsewhere described,\* all the peculiarities of a British

\* *Archæologia*, vol. xlii.

earthwork; and the occurrence of the deep shafts and large pits in connection with it, afforded an opportunity of ascertaining definitely the age of the camps with reference to the stone period. Valuable as previous discoveries had already been, the opportunity thus afforded of establishing a sequence between these two distinct classes of prehistoric remains appeared to exceed them all in interest and importance.

I have already stated the superficial grounds on which I had hazarded a conjecture on this point, and I had applied myself more directly to the question in 1867, by opening a section in the ditch of the entrenchment on the west side (E. fig. 1, Pl. xiv.), the result of which is thus stated in my former paper:—"No trace of pottery or metal, or anything but a few bones and about five or six flint flakes, were found in the upper part of the silting of the ditch; but on reaching the chalk, 3 feet below the surface, there were a few large flint-nodules, and amongst these, lying on the original floor of the ditch, were twelve worked flints, mostly of rude form, but including one of the best celts found in Cissbury." These, then, must have been deposited before the ditch began to silt up; and the absence of anything Roman afforded strong presumptive evidence that the flints were of the age of the entrenchment; but, as I said at the time, it was not conclusive.

I now, in April of the present year, opened another section in the ditch (F. fig. 1, Pl. xiv.) more to the southward, 20 feet in length and 5 feet wide. This section was 200 paces to the westward of the south-west entrance to the camp. It was cut in three horizontal layers of about  $1\frac{1}{2}$  foot each, and each layer was completed before the other was commenced, so that there might be no confusion between the objects found at the different levels. Brown mould was found beneath the turf for a depth of 6 to 8 inches, then hard rubble. The following were the results:—In the upper layer, two oval flint implements, one rude chipped block, a fragment of rounded tile, oyster shells, large snail shells, horses' teeth and bones, bone of a small ox, a fragment of goat's horn, and several fragments of Romano-British pottery, having grains of sand in its composition, amongst which quartz predominated, similar in texture to that found on the surface of the ground in the interior of the camp.\* All this was in the upper layer of  $1\frac{1}{2}$  foot. In the second and middle layer, which consisted of ferruginous chalk rubble interspersed with a number of large untouched flint-nodules, and

\* This pottery was all of the same quality,  $\frac{1}{4}$ -inch thick, of a dull red colour on the outside, and of a brown earthen colour in the middle. When found on the surface, it is associated with grey pottery of another description, and a few fragments of Samian ware.

was somewhat harder than the first layer, there were found four rough-chipped blocks of flint, one flint flake, sixteen oyster shells, about two hundred large snail shells, and about the same number of *Helix nemoralis*. There was no pottery found in this layer. In the third and lowest layer, which extended to the original undisturbed chalk bottom of the ditch, 5 feet beneath the silted-up surface, and which consisted of white chalk rubble with a few flint-nodules, there were found a skull and bones of pig, bones of small ox,\* a number of oyster shells, a quantity of *Cyclostoma elegans*, and one small fragment of British pottery, different in texture from that found above and from that found on the surface in the interior, being smoother and thicker, about one-third of an inch thick, containing fewer and larger grains of quartz, more pasty in texture, light red on the outside and black in the middle, and resembling the pottery of some British urns found in tumuli.

This again was in favour of the pre-Roman origin of entrenchment, no metal or anything certainly Roman having been found in the ditch, and all the pottery which might be attributed to Romano-British origin having been found close to the top.

One peculiarity in the construction of the ditch deserves notice; and from its having been found in this section, and the two afterwards opened, appears to be a constant feature. The original bottom of the ditch was flat and smooth, and like the escarp and counterscarp (front and back sides of the ditch), had been cut out of the solid chalk; but in the middle of the bottom, running along the length of it, a small bank or ridge of solid chalk, about 3 feet wide and 2 feet high, had been left, which, from its resemblance to a work of that name in modern fortifications, I call a *Fausse-braye* (N. fig. 4, Pl. xv.). The use of this *Fausse-braye* it may be difficult to determine; but I suggest that as the rampart when first thrown up must have been very loose and liable to fall into the ditch, it may have been intended to catch the rubble as it fell into the ditch, and prevent its falling against the counterscarp. By this means the outer portion of the ditch may have been kept open.

Another observation worthy of record for the guidance of future explorers of rampart ditches is that the ditch, in silting up 5 feet in the course of ages, also moved about 4 feet outwards, that is to say that the present centre of the ditch is from 3 feet 6 inches to 4 feet more towards the outside than the centre of the original excavation. The reason of this is obviously on account of the greater quantity of material which has fallen into it from the large rampart in the interior than has accumulated

\* Identified by Mr. Busk.

from the small rampart on the outside of the ditch. Still, however, the main object of my search—viz. to discover the mouth of a shaft in the ditch, by which to determine the relative age of the two works—had not been reached, and it was evident that in order to settle the question, excavations of much greater extent would have to be made.

As the cost of the diggings had already been considerable, and I was unwilling to undertake the expense of the additional excavation without assistance, I determined to refer the matter to the Anthropological Institute; and it may, I think, be taken as an indication that the Institute is not without vitality that I obtained a subscription of £30 from the members in a single evening. I therefore again set to work, assisted from time to time by Mr. Park Harrison, Professor Hughes, Professor Rolleston, Sir Alexander Gordon, and others. All that I have said hitherto may therefore be regarded as preliminary to the report of the exploration committee, which properly begins here.

The point now to be determined was, where to cut the next section in the ditch. In deciding this I was guided by the following considerations. The pits now ascertained to be the mouths of shafts are found in isolated places, everywhere in the interior of the entrenchment (fig. 1, Pl. xiv.), but not, as a rule, on the outside of it. They are chiefly clustered in the south-west corner, which is completely honeycombed with them down to the interior slope of the rampart. But not a single pit is to be seen on the outside, at least towards the westward, where the superficial soil over the chalk is very thin, so thin that the slightest break in the chalk would be apparent on the surface. The rampart here defines sharply the boundary of the cluster of pits on this side, and it is evident to anyone accustomed to look at ground with a view to defence that the line of the rampart has been determined by tactical considerations. It would appear, therefore, from this as if the pits must have been constructed after the rampart; indeed, this coincidence of the line of the rampart with the margin of the cluster of pits has still to be accounted for, notwithstanding the results of subsequent investigations. I had examined repeatedly the line of rampart, to see if in any case the circle of any of the pits passed under the rampart on the inside; but in no case did they appear to do so, although they came close up to it in many places. But on the south-west side a belt of thirty-nine very shallow depressions (GN. fig. 1, Pl. xiv.) might be seen running from the rampart on the outside, in a southerly direction for about 300 yards, nearly parallel to the road leading from Worthing to the south-west entrance, and about 100 yards from it. These depressions



were so shallow, not being more than a foot in depth, and differed, in this respect, and also in the small size of the diameters of some of them, so much from those in the interior of the entrenchment,\* that they were not generally supposed to be the mouths of shafts, and it had been suggested by some of the explorers of Cissbury that they might perhaps be the graves of the inhabitants of the place.

I determined to examine the two nearest to the rampart of this belt of depressions, one at 30, and the other at 50, paces from the outside of the ditch (G. fig. 1, Pl. xiv.), and having dug 4 feet into both of them, I ascertained by the perpendicular chalk sides of the circular excavations found beneath the surface, that they were the mouths of shafts. In them were found several fragments of coarse red and brown pottery, unevenly coloured, and having large grains of quartz in the composition, differing, in this respect, from the surface pottery, and from that found in the upper parts of the ditch, and a piece of stag's-horn, which might perhaps have been used as a pick. This being so, and it being evident that the whole of this belt of shallow depressions were shafts, I perceived that they must, if continuous with the cluster of pits in the interior, and if made before the ditch and rampart, be found beneath the silting of the ditch, at the spot where the line of the ditch intersects the belt of shafts. It was found by measurement that the whole of the depressions on the outside averaged about 18 feet in diameter, and were at distances averaging 10, 12, and 15 yards apart from centre to centre, consequently, if they were originally continuous with the cluster in the interior, and at the same distance apart, they must be found in the space of 100 feet, now occupied by the ditch and rampart; and although, as I said before, there was no indication of them on the surface within 30 paces of the ditch, or anywhere in the ditch, all such traces of them might possibly have been obliterated by the constructors of the entrenchment.

Having thus decided upon the spot for the excavation, we re-commenced digging on the 11th June, 1875, and continued employing from five to ten men daily, with some breaks, until the end of September.

In order to avoid ambiguity, I will now abandon the order of discovery, and give the results of the excavation of each part separately, commencing with the ditch.

The excavation in the ditch was 40 feet in length and 12 feet wide, and the spot selected was situated between the last cutting and the south-west entrance, at a point where the entrenchment forms a very obtuse salient angle (H. fig. 1, Pl. xiv.). It was

\* It was also noticed that no flint-chips were found on the surface near them.

cut in three horizontal layers, of from  $1\frac{1}{2}$  to 2 feet each, as before (fig. 4, Pl. xiv.), with the following results. No pottery was found in the upper or lower layer, but was confined to the middle layer, at a distance of between  $1\frac{1}{2}$  to 3 feet from the surface; the shells were oyster and snail shells, as before, and were found in the upper and middle layer, but not in the lowest layer. The greater part of the pottery was of a grey colour, without quartz grains, similar to some found on the surface in the interior. This pottery was remarkable for its laminar structure, peeling off into thin plates when wet, and differing from that found in the other section of the ditch, but, probably, like it, of Romano-British fabrication.\* The bones were exclusively those of domesticated animals. A number of rounded sea-shore pebbles were found in all three layers, and these being of nearly uniform size, from  $1\frac{1}{2}$  to 2 inches across, appear probably to have been selected, and may have been used, as sling-stones. Pebbles of this description are found in tertiary deposits, in patches, on the hill, but not in the immediate vicinity of this spot. A few rude flint tools and several chipped blocks were found in all three layers, and an occasional flint flake here and there, but the discovery of most interest in the ditch consisted of a nest of flint chips, 236 in number, and a rude chipped flint block, all of which were contained within a space of about 2 feet in diameter and 1 foot in depth (P. fig. 4, Pl. xiv.). They were in the bottom of the middle layer, and about  $1\frac{1}{2}$  foot from the bottom of the ditch. These, then, must have been deposited in a mass in this spot at some time subsequent to the construction of the ditch, after it had already silted up  $1\frac{1}{2}$  foot. They were situated in the ditch, about half-way between the spots where the two shafts, to be hereafter spoken of, were discovered, in a seam of the silting which formed what is geologically termed a synclinal bend, showing that the silting had fallen in from both sides, that is to say, that the ditch here had silted up gradually during long periods of time. These chips are of the character of the wasters formed by manufacturing a flint implement, and the most reasonable hypothesis that can be based upon them is that they afford evidence of the construction of a flint implement on this spot at some time subsequent to the formation of the entrenchment. A similar nest of chips, to be hereafter spoken of, in the body of the rampart serves to strengthen this opinion. The bottom of the ditch was found, as before, at 5 feet beneath the lowest part of the silted surface, and in the centre of it was again found the *Fausse-braye* already described (N. fig. 4, Pl. xiv.).

\* By this term is understood pottery made by the Britons during Roman occupation, and under Roman influence.

As the excavation of the ditch proceeded from the top downwards, the solid chalk sides (escarp and counterscarp) were laid bare on both sides, and it is hardly necessary to say that in all these excavations we were careful not to cut into the undisturbed chalk, our object being to lay bare the original excavations, by digging out the rubbish of all kinds, whether formed by rain-wash, which, for the sake of clearness, will be hereafter termed "*silting*," or thrown in by the hands of the prehistoric men, which will be spoken of as "*filling*," in this paper. We found that the sides of the ditch generally stood at a slope of about 5 to 1, as before, but in one place, towards the western extremity of the cutting, we observed that the escarp was upright for the space of a few feet, and also that the rubble adjoining this upright part, and between it and the line of the slope, consisted of white chalk, in which respect it differed from the ferruginous colour of the silting of the ditch, and we at once conjectured that this white chalk was probably the *filling* of a shaft which had been cut through by the ditch-makers at the usual angle of the slope of the escarp. On reaching the bottom of the ditch our surmises were confirmed by finding the circular margin of a shaft about 9 feet in diameter (E. fig. 1, Pl. xv.), which penetrated about 4 feet into the escarp and extended across the ditch to within 2 feet of the bottom of the counterscarp on the other side. We then followed down the nearly perpendicular sides of this shaft until we reached the chalk bottom at 6 feet 6 inches beneath the bottom of the ditch (E. fig. 2, Pl. xv.). It had been filled up entirely with chalk rubble, including some blocks of considerable size, and we could find no trace of successive periods of filling, such as had been previously noticed in the shaft excavated by Mr. Willett.

The rubble of both this and the other shafts afterwards opened was of uniform density, and had evidently been filled in at one time. In the bottom of this one, on the north side, a small step of about a foot led to a gallery 25 feet in length, which ran obliquely under the main rampart in a direction nearly due north. The access to it was by a small opening 2 feet 5 inches in width by 1 foot 8 inches in height, and we observed a large flint-nodule *in situ* immediately over the top of this opening; the gallery itself, like most of those subsequently discovered, and like those of Spiennes, appeared to have been partially filled up by the people who made it. When cleared out, it was about 3 feet high from the floor, which latter was cut in one or two steps, and rose at a general angle of about  $5^{\circ}$  towards the north (fig. 2, Pl. xv.). The roof was flat and cut on the line of stratification, not arched, as it would have been if intended to be used as a habitation. The gallery opened out laterally to a width

of from 8 to 10 feet in three places (fig. 1, Pl. xv.) but without any increase of height; and these wide places communicated with each other by narrower necks 3 feet in width, so that it was evident the wider places were only cut out in the search for flints, not to be used as chambers, and the narrow necks between them were intended to support the roof, which, had it been undermined uniformly to a width of 10 feet, might probably have fallen in upon the workmen. On the west side, from 6 inches to a foot above the level of the floor, a seam of flints, nine of which were found *in situ*, ran along nearly on the same line as the floor of the gallery, that is, rising at an angle of  $5^{\circ}$  towards the north, and showing clearly the object of the gallery, and the cause of the direction that had been given to it. These flints had been broken off flush with the chalk by the prehistoric workmen, and showed a blue fracture.

I have described this first discovered gallery in detail, because the same description will apply to the majority of those opened afterwards. On the south side of the shaft, which, on account of its cutting into the escarp, was called No. 1 escarp shaft, another small step led to another gallery running southward, on the same plane of inclination, and after tracing this 11 feet, we found, by the line of the rubble rising, that we had in all probability entered another shaft (F. fig. 1, Pl. xv.). The truth of this was confirmed by digging down from the top, when we exposed a shaft slightly oval in form, having three galleries running from it, one 16 feet long, on the south; one to the north, which afterwards turned eastward and ran along the line of the counterscarp, and another communicating with two chambers, 10 and 7 feet high respectively (fig. 2, Pl. xv.); whether these chambers were originally of that height, or had been enlarged by the falling-in of the roof subsequently, we were unable to determine.

The side of one of these chambers was formed on a vein of tabular flint about an inch in thickness. Dixon, in his "Geology of Sussex," mentions the occurrence of vertical veins of tabular flint at Findon Hill, close by, and the same peculiarity is very noticeable in the chalk here; tabular seams from 1 to 2 inches thick were found to cut the shafts and galleries in many places, both vertically and in an oblique direction; but it does not appear to have been much employed by the prehistoric men. Only one piece of it was found chipped to an edge, and the quantities of it found in the rubble, sometimes pounded up into small fragments, show that it could have been but little used.

The chief interest of this shaft consisted in its being situated beneath the small outer rampart, which in this part of the camp runs along on the outside of the ditch. The stratifications

showed that the shaft had been filled up to the surface with chalk rubble. In process of time the rubble, having settled down, formed a hollow similar to those now found on the surface in so many places. Into this hollow a sediment of surface clay had been deposited by rain-wash, shown by a red cup-shaped line of clay, with charcoal, 6 inches thick; and above this, the constructors of the ditch had thrown the small rampart of chalk rubble, 3 feet 6 inches in height; this formed a second point of evidence proving the greater antiquity of the shafts than the entrenchment. The lowest part of the above mentioned cup-shaped seam of clay was about 8 feet higher than the bottom of the ditch. The bottom of this shaft, which from its touching the counterscarp on its northern edge was called No. 1 counterscarp shaft, was 1 foot 7 inches lower than that of No. 1. escarp shaft, the fall coinciding with the plain depression of the seam of flints, the line of which was observed, as before, on the sides of the galleries.

At the eastern end of the excavation in the ditch, another shaft was found, and was named No. 2. escarp shaft (G. fig. 1, Pl. xv.). It cut further into the escarp than the one first described, and extended only about half-way across the ditch. As we had destroyed the evidence of the relative antiquity of the two works afforded by No. 1. escarp shaft, it was determined to preserve a section of this shaft, which might be seen by any geologists who might visit the diggings; accordingly we excavated only the half of this shaft which was nearest to the other, leaving a vertical section of the *filling* and *sitting* across the middle; this section is shown in the drawing (Pl. xvi.). It will be seen that there are red seams (marked by shaded lines AA. Pl. xvi.) in the *filling* of the shaft, caused probably by portions of red clay having been thrown in whilst filling it up. These red seams, it will be observed, are unconformable with the red seam of lighter colour (BC. CD. Pl. xvi.) which marks the line of the escarp and the bottom of the ditch where it cut through the *filling* of the shaft. This latter seam was formed by *sitting*, that is by rain-wash, either at the time the ditch was open, or, perhaps, subsequently by argillaceous matter percolating through the *sitting* after it had been formed, until it was arrested by the harder line of the escarp and bottom. The two lines marking the escarp and bottom, it will be seen by the drawing, are in continuation of the solid chalk lines of the ditch, and they constitute a third and most conclusive proof of the priority of the shafts. We were so fortunate as to be able to keep this section open until it could be seen by Mr. Prestwich, F.R.S., who has paid such special attention to seams of gravel. He confirmed the evidence afforded by these deposits,



and pointed out to me the different constitution of the red seams (AA. Pl. xvi.) in the *filling* from those of the *silting* (BC. CD. Pl. xvi), for whilst the former consisted of nearly unaltered clay, as it is now seen upon the surface of the hill, the latter was formed by a mixture of clay and chalk in minute particles as mixed by the action of rain-water. Amongst those who visited the diggings on this occasion were Sir B. Brodie, F.R.S., Mr. Godwin Austen, F.R.S., Mr. John Evans, F.R.S., President of the Geological Society, Professor Rolleston, F.R.S., of Oxford, Mr. Busk, F.R.S., late President A.I., Mr. Auberon Herbert, Mr. Bowman, F.R.S., and Professor Smith, F.R.S., of Oxford, all of whom were satisfied with the convincing nature of the evidence afforded by this section.\* At the bottom of this shaft, which was on the same level as that of No. 1 escarp, two galleries ran northward, one of which was 27 feet (the longest found), another ran about 10 feet under the ditch to the west, and on the south were three excavations of considerable width, supported by pillars left in the solid chalk; between these galleries there were two small windows about a foot square, the object of which appears to have been to probe the sides during the excavation and ascertain the distance from the adjoining gallery. A similar window was described in one of the galleries formerly opened by Mr. Willett. Over the entrance to one of these galleries, on the south of No. 2 escarp shaft, some rude scoring was found. It had been executed with a flint, and consisted of longitudinal scratches scraped with a broad edge of a flint, over which nine vertical scratches had been cut with a sharp edge. The surface of the chalk had been coated with a ferruginous oxide which had been scraped off by the flint, leaving the scratches white. Some similar scratches were seen on the side of the entrance to the west gallery. These were discovered on a Monday morning, and I myself saw a portion of them uncovered. I have no reason to doubt their genuineness, but the tools had been left in the diggings during Sunday, and the facility with which marks are made in chalk makes it necessary to receive any such facts with caution. With the exception of these scratches found in one place towards the close of our investigations, the absence of any scoring in the shafts and galleries was remarkable. I was on the look out for them from the first, but for obvious reasons avoided mentioning the subject to the workmen. A rude nondescript figure was also found, cut with a flint, on a block of chalk in the rubble of the shaft near the same place, and several fragments of chalk appeared to have been scratched by animals. The

\* A letter from Mr. Prestwich on the subject is appended to this paper.

galleries from this shaft did not communicate with those of any other shaft.

Reverting now to No. 1 escarp shaft (E. fig. 1, Pl. xv.), a gallery was found running eastward under the ditch in the direction of No. 2 escarp shaft; but this, in consequence of the wet having penetrated the roof from the bottom of the ditch which had been exposed to rain, soon fell in and was abandoned. Another gallery led under the ditch to the westward. The roofs of these galleries were only 3 feet beneath the bottom of the ditch, which affords a fourth proof of the priority of the galleries. Had the ditch been open at the time, the miners would not have run galleries at so short a distance beneath the ditch.

This gallery had two branches. One to the south-west communicated by means of one of the small windows before spoken of, with other galleries afterwards opened. The other, running west, led to another opening, to which we obtained access by a narrow neck; there was also a communication by means of a window, and the opening beyond being the first found that presented this peculiarity—for it must be remembered that I have not been describing them exactly in the order of their discovery—was named the Window Chamber. Proceeding through this, we found at a distance of 18 feet from No. 1 escarp shaft that the rubble rose, indicating the presence of another shaft (H. figs. 1 and 3, Pl. xv.). The bones of animals now appeared for the first time in considerable quantities, mixed with quantities of *Helix nemoralis*. Presently a well formed and perfect lower human jaw fell down from above, and on looking up we could perceive the remainder of the skull fixed with the base downwards, and the face towards the west; between two pieces of the chalk rubble. When I saw this, I hollowed out so loudly that Mr. Harrison, who happened to be outside at the time, although he had been himself previously assisting in the excavation of this gallery, thought that it must have tumbled in, and came with a shovel to dig us out. It was some time before I could make him understand that we had added a third person to our party.

The position of the skull above the bottom of the shaft was found to be 2 feet 6 inches. The bones of the body were found afterwards in the shaft above the skull, so that the woman, for such it was, was placed with the head downwards. The skull, however, had been turned over with the crown up, which may perhaps be regarded as evidence of her having fallen into the shaft. Pl. xix. shows five views of this dolichocephalic skull, which is described by Professor Rolleston as being of unusually large size, having a cephalic index of 75, and a cubic capacity of 105 inches. A more detailed account of it will be given

by him hereafter. It was now decided to excavate this shaft from the top. Having been called away for a day by military duty, the excavation was conducted by Professor Rolleston, F.R.S., whose services we were so fortunate as to secure at this time. A cutting 6 feet wide was made across the ditch at a distance of 16 feet from the former cutting. (A section of this is shown in fig. 3, Pl. xv.). The bottom of the ditch was reached at 5 feet beneath the top of the silting as before. The shaft, now named the Skeleton Shaft (H. figs. 1 and 3, Pl. xv.), was found near the middle of the ditch, cutting through the Fausse-braye, which was seen in the sides of the section made in the ditch. This shaft was smaller than the others, being only 4 feet 6 inches in diameter, and its depth 6 feet 3 inches. The bottom, consequently, was only 7 inches lower than that of No. 1 escarp shaft. At 1 foot from the bottom, and 1 foot 6 inches beneath the skull, there was a red seam in the rubble, marking probably the line at which the shaft may have stood open for some time; and this seam penetrated into a gallery to the south. Over the shaft and on the level of the bottom of the ditch, a horizontal red seam of silting was traced through the rubble, and spreading also over the bottom of the ditch, rising over the line of the Fausse-braye, thereby constituting a fifth proof of the priority of the shaft. With the skeleton were found remains of four pigs, ox, goat, fox, and roe, which will be described in detail by Professor Rolleston.

From the skeleton shaft, a gallery 3 feet long led to another shaft on the south (K. figs. 1 and 3, Pl. xv.), about 9 feet in diameter, and named No. 2 counterscarp shaft, the bottom of which was on exactly the same level as that of the skeleton shaft. From it, four galleries led to the south, east, west, and north-west. That to the east communicated by means of a window with the galleries from No. 1 escarp shaft; that to the north-west opened into a kind of irregular square chamber, which looked into the skeleton shaft by means of a small window. All these so-called chambers, by us, were of the same height and character as the others, except that to the west, which was 8 feet high, and had, in the roof, a small hole about 3 inches high, apparently formed by hand. On excavating the rubble from this shaft, the line of the counterscarp was found, marked by a red seam of silting passing at the usual angle across the rubble in the manner already indicated in the case of the escarp in Nos. 1 and 2 escarp shafts (fig. 3, Pl. xv.). This constitutes a sixth proof of the priority of the shafts. Above this shaft was found the red cup-shaped seam formed by rain-wash over the top of the shaft after it had been filled in, as in the case already noticed in No. 1 counterscarp shaft, and

over this again was found the chalk rubble of the outer rampart, thus forming a seventh proof of the priority of the shafts.

Out of the skeleton shaft to the north, a gallery 7 feet long led to another shaft under the main rampart (L. figs. 1 and 3, Pl. xv.), termed by us, Rampart Shaft. The rubble out of this was excavated from beneath sufficiently to ascertain that it was a shaft, and a hole having been made through the rubble, the opening to another gallery 8 feet long was found leading to the north-east, which was entered and measured. This shaft being situated entirely beneath the main rampart, affords an eighth proof that the flint mines are older than the entrenchment.

The whole network of galleries thus disclosed were driven along the same vein of flints, traces of which were seen upon the sides of nearly all of them. The marks where the punches formed of the tines of deer horn (fig. 3, Pl. xviii.) had been used to extract the flints were seen in a number of places, and pieces of chalk having on them the marks of the points of these tines taken out of the galleries from positions where our own picks had not been used, were preserved for the inspection of the members. The chalk on this line of hills, forming, as all geologists are aware, the southern spring of the great anticlinal arch of the Wealden, rises here everywhere at an angle towards the north, the network of galleries following the seam of flints are all driven upon the same plane of stratification, rising at an angle of about 5 degrees towards the north. Having taken careful levels between this and Mr. Willett's and Mr. Tyndall's shafts, in the interior of the camp (K. and L. fig. 1, Pl. xiv.), and assuming Mr. Willett's shaft to have been 20 feet deep before it became partially re-filled, as is the case at present, I find that the bottom of Mr. Willett's shaft is 18'31 feet above that of the shaft E, which we excavated in the ditch. Allowing for the distance between them of 316 feet, taken obliquely in the plain of ascent, it appears quite possible that the same vein of flints may have been worked in both places. But assuming Mr. Tyndall's shaft to have been 39 feet deep, the bottom of it is 38'23 feet lower than that of Mr. Willett's, consequently, the same vein could not have been worked by these latter shafts, the distance between them being 190 feet.

In the rubble taken out of our shafts and galleries, large quantities of broken flint-nodules were found; all, however, it was noticed, being too small, or too irregular, for the construction of a good implement; and hence, probably, the reason for their having been abandoned. Like those of Spiennes, all these fractured nodules, without exception, were of the unaltered blue colour of the flint. Amongst them, however, were found in the

galleries three or four flakes (distinguishing by this term, flakes from chips), and these flakes had a white patina like those found on the surface.\* This shows that the shafts were filled-in quickly by the people who made them from materials probably taken from other pits before the fractured flints had time to become discoloured, but with them were thrown in several flakes which had lain for some time on the surface, and become whitened by exposure to the air and moisture. These particular shafts, therefore, were not the earliest of the series excavated in Cissbury.

Only one or two rude flint implements were found in the shafts. Animal remains, with the exception of those found in the skeleton shaft, were rare; fragments of deer horn were plentiful, but none which could with certainty be called picks. Broken tines (fig. 3, Pl. xviii.), which I shall afterwards show were used as punches, were common, all extremely rotten and difficult to preserve—no pottery, with the exception of one fragment of coarse red, with quartz, found in the red clay above No. 1 counterscarp shaft, and which may consequently be of a later period than the shafts. The blade-bone of a small ox was found near the bottom of No. 1 escarp shaft. The general incline of the slope of the hill showed that the shafts, at the time they were excavated and filled up, were about 17 feet deep beneath the then surface (fig. 3, Pl. xv.), and that the western group of five communicated with each other, whilst the one to the east was isolated. The small diameter of the skeleton shaft, and its proximity to No. 2 counterscarp shaft (fig. 3, Pl. xv.), has caused some doubt as to whether it could really have been a shaft extending to the surface, or only a chamber higher than the other galleries, the top of which may have been cut off in the formation of the ditch, but the ground plan shows that three galleries led from the skeleton shaft, which is in favour of its being a shaft; and it will be remembered that at Spiennes some of the shafts were of still less size, and are described as being quite close together. We must assume, therefore, that this was a shaft, and that the woman found in it, from some cause unknown, either fell in or was thrown in at some time previous to its being filled up.

We then commenced cutting a section 11 feet wide (AUVX. fig. 1, Pl. xv., and S. fig. 2, Pl. xv.) through the rampart above the cutting in the ditch, with the object of further ascertaining the age of the entrenchment, it being obvious that all objects found in the rampart must be of the same age, or earlier, than the date of its construction.

\* Specimens of these flints were exhibited at the meeting.



It had already been noticed that the *Déblai* was not equal to the *Remblai*, and consequently all the earth of the rampart could not have been excavated from the ditch. This was confirmed by the section 1. ~~re~~ opened, in which we recognise—1st, the surface earth thrown up from the ditch marked by a brown colour; 2nd, the chalk embankment thrown over it from the lower parts of the ditch; and 3rd, an addition to the rampart formed by successive layers of turf and rubble, of which as many as seven alternate layers were counted in one place. The original slope of the hill was marked by a red seam representing the original turf line and surface soil, before the rampart was thrown over it, and the greatest height of the rampart above this was 9 feet. Flint flakes, weathered and whitened, were found occasionally all through the rampart, also *oyster shells*, *Helix nemoralis*, *Cyclostoma elegans*, and *Helix ericetorum*. Bones of the roe and calf were found and identified by Professor Rolleston. About twenty-five fragments of pottery were found in the rampart at different levels, some, 5 feet beneath the top, in the centre, all of which was hand-made, black, or brown red, with grains of quartz, imperfectly baked and unevenly coloured, about  $\frac{1}{4}$ -inch thick, corresponding to the British pottery found in tumuli, and differing both from the Romano-British pottery found in the ditch and on the surface, and from the coarser kind of pottery which had been found in the large pit in the interior. One of the most interesting relics discovered here was a flattish piece of chalk (fig. 6, Pl. xviii.) about  $\frac{3}{4}$ -inch thick, and from 2 to 2 $\frac{1}{2}$  inches across, perforated by a hole half-an-inch in diameter which had been bored from both sides. Objects of this description, though common amongst prehistoric antiquities in stone, are not usual in chalk, the only other recorded instance of one made of chalk, that I am aware of, being, curiously enough, that found 18 feet deep in a shaft in Grimes Graves by Canon Greenwell.\* Several rounded sea-shore pebbles, similar to those found in the ditch, were also discovered in the rampart. A nest of about forty-six flakes and chips was found within the space of a foot and a half, beneath the exterior slope of the rampart, all of which must have been deposited together at one time. This concludes the excavations in and about the rampart.

We now turn our attention to the large pit in the interior which had been already excavated to a depth of about 12 feet (M. fig. 1, Pl. xiv., and fig. 3, Pl. xiv, and figs. 1, 2, and 3, Pl. xvii.), our object being to ascertain whether the greater size of this pit, nearly 66 feet in diameter, was owing to any difference in

\* "Journal of the Ethnological Society of London." New Series. Vol. ii., page 430, read June 27th, 1870.

the mode of construction. It was decided to excavate half of it in the same manner as had already been done in the case of No. 2 escarp shaft, leaving a vertical section of rubble across the middle, and, penetrating as deep as we could, to reach the bottom if possible, if not, to ascertain the form of the upper half. A scaffolding and windlass having been erected over the shaft, we sank down to a depth of 42 feet beneath the highest margin, when, wet weather coming on, and the rubble becoming rotten, a great fall in the night filled up a part of what had been excavated, and would have buried the workmen had they been there. It became evident that in order to reach the bottom it would be necessary to excavate the whole shaft, for which our funds were insufficient, and moreover, having already attained the bottoms of six shafts, it was unnecessary, and our time was better employed in clearing out the upper portions of the half-pit and throwing the rubble into the bottom, thereby filling up at the same time, which having been made one of the conditions of the landlord, Mr. Wisden, we were bound to perform.

Six distinct seams of flint (figs. 2 and 3, Pl. xvii.) were found on the sides of this pit, at from 5 to 6 feet apart. The two upper seams coincided with the floors of ledges or terraces cut in the sides of the pit (A. and C. figs. 1, 2, and 3, Pl. xvii.), these seams of flint being found in the corners of the terraces in the chalk wall just above the floor. Here and there small caves had been run in to get out more flints (B. fig. 1, Pl. xvii.). On the south-west side also, a gallery 8 feet long (D. figs. 1 and 2, Pl. xvii.) had been driven on the second terrace. These terraces were only a foot wide on the north and south sides, but the second terrace widened to 10 feet on the west side. Below that, the remaining four seams were cut through vertically, the shaft widening somewhat towards the bottom. This terrace formation had the effect of finally convincing those few neighbours who until now had still doubted that the excavations were made for flints.

The cause of this difference of form from the other shafts is easily explained. It depended on the depth beneath the surface at which the upper seam of flints was reached. We will assume that in all cases a small shaft about 9 feet wide was sunk first, when the seam was not attained until a depth of 17 to 20 feet was reached, as was the case on the south side of the series, then galleries were driven along the seams, it being too deep to excavate them by surface workings. But in the case of this large pit, situated on the north of the series on the slope of the hill, the upper seam was reached at 3 feet from the surface. It was therefore worked out by surface workings, enlarging the

shaft, and spreading out all round until the seam cropped out on the lower side of the hill, and got too deep for surface working on the upper side (see sections, figs. 2 and 3, Pl. xvii.). They then formed a terrace and went down to the next seam, which was worked out in a similar manner, the ledges left at the levels of the upper seams serving for the men to stand on and draw the rubbish up from the lower levels by means of ropes and skins, or baskets. This explains the large size of some of the pits, all of which large pits will probably be found on examination to be terraced in the same way.

In the vertical section of the rubble left standing across the centre of the pit, a red seam (EE. fig. 3, Pl. xvii.) is seen. This represents a cup-shaped deposit of harder rubble which was found all over the pit, the lowest part of which seam was about 8 feet beneath the similarly cup-shaped surface. This line probably marks the surface of a first *filling* which may have stood at this level for some little time, and been subsequently covered by another *filling*, making it 8 feet higher. The greater part of the animal remains, chipped implements, and flakes were found in this seam. Probably the fabricators worked their flints in this sheltered hollow, judging from the immense number of flint chips found in the seam, and it is important to notice that a considerable portion of the rubble overlaying this seam consisted of white chalk—*filling*, not *silting*—obtained probably from the opening of a second shaft subsequently to that from which the first *filling* was obtained, and thrown into the hollow after it had for some time been used as a workshop, consequently all the animal remains found in this seam are of the age of the shafts, and not of any subsequent period.

The greater part of the animal remains found, appear to be those of domesticated animals, and consist of small ox, goat, and red deer, the details of which will be given hereafter by Professor Rolleston. One small jaw of goat was found 33 feet beneath the upper margin. Rude flint implements were found all through the *filling*, but chiefly in the red seam; those near the bottom were of the blue colour of the flint. Charcoal was found at a depth of 30 feet below the upper margin, and has been identified by Mr. Alfred White, F.S.A., as referable to furze, willow, and beech. The pottery in the superficial soil was of a similar character to some of that found in the ditch, but at a depth of 13 feet below the surface in the *filling* (F. fig. 3, Pl. xvii.), three pieces of a different description were found by me, in my previous diggings. This pottery was of two kinds, one red on the outside,  $\frac{3}{4}$ -inch thick, mixed with large fragments of white quartz, some of which were as much as  $\frac{1}{2}$ -inch in size (fig. 7, Pl. xviii.), the other a fragment of the

rim of a large vessel (fig. 8, Pl. xviii.) of dark brown pottery, hand-made, about  $\frac{1}{8}$ -inch thick, mixed with smaller grains of quartz. This last, as shown by the fragment of the rim, must have been a vessel about 9 inches in diameter at the mouth, and enlarging to 13 inches at about 2 inches from it. The texture of this pottery found in the shaft shows it to be of coarser quality than any found on the surface or in the ditch in Cissbury. Another fragment of this coarser kind was now found 18 feet from the surface, and consequently some distance below the line of the red seam.

The implements of deer horn consisted of tines cut with flint round the surface, and snapped off (fig. 3, Pl. xviii.) ; also one or two wedges of deer horn cut with flint, one of which was ground all round (fig. 2, Pl. xviii.). Some of the pieces were cut with a notch all round, but not separated, and fragments of horn were found in great abundance, showing that the material must have been plentiful. They were very rotten, and none were found which could with certainty be said to have been used as picks, though several pieces were battered at the thick end as if used for hammering. A chalk cup, similar to those found by Canon Greenwell and to one found by Mr. Tyndall, was brought up from a depth of 30 feet. Also a piece of deer horn about 4 inches in length, cut with a flint on both sides, as if preparatory to the formation of a bone pin, and abandoned before completion.

In order to ascertain the exact mode of working the chalk by the prehistoric men, I made a set of deer-horn tools similar to those turned up in the diggings. Out of a pair of antlers I made two picks, one mandril, two wedges, and five tine punches. Cutting off the tines with a flint took me from five to ten minutes, and the best mode of making the wedges was found to be by grinding them on a wet sandstone. Commencing with a surface of hard, smooth chalk, and taking the work turn about with one of the men, I found that we had made an excavation 3 feet square and 3 feet deep in an hour and a half, consequently, by continuous labour, and sufficient reliefs, it would have taken us twelve hours to form the longest gallery found, viz. 27 feet. Mr. Harrison also applied one of the picks to a chalk nodule which was sticking out of the side of the chalk, and found that with it he could break it off flush with the side of the chalk, in the manner seen in the sides of the galleries. The pick, however (here at least), was not the chief tool used, but the wedge and punch, driven into the cracks in the chalk with the thick end of the horn, served to loosen the large blocks, which were then easily removed with the pick and the mandril. One of the wedges found in the rubble (fig. 5, Pl. xviii.)

showed clear evidence of having been used in this way. The edge was bruised and pierced, and a flake of the horn, about an inch square, was turned up at an angle of  $45^\circ$ , the interstices being filled with battered chalk, which could have been forced in only by hammering it into the chalk. When soaking this specimen in glue to preserve it, the chalk was dissolved out and the flake detached, but I have been able to glue it on again, the fractured portions fitting accurately, so as to show clearly the use to which it had been put.

In order to test the use of the blade-bone as a shovel, I obtained three blade-bones of our larger modern ox, and having cut off the spines, used them as shovels in the hand, modifying them for use in the different ways suggested by the experiment. I found that, using small chalk rubble, I could fill a wheelbarrow with it in five minutes, but with the hands I could do so in four minutes. Although this is unfavourable to the blade-bone, the saving to the hands must be considered.\* On the other hand, I found that the sharp edge of the *glenoid cavity* injured the hand whilst shoving it into the rubble, and would certainly make a sore place in time, unless rounded; but neither of the two specimens of blade-bone found in the rubble were modified in this way. The edge of the *suprascapular border*, which would form the edge of the shovel, is  $\frac{3}{4}$  of an inch thick in two places, and  $\frac{1}{2}$  of an inch thick everywhere; this would have to be sharpened, even iron shovels require to be kept sharp, but it was untouched in both the specimens found in the rubble. The bone had probably been buried with the partially ossified *suprascapular border* attached to it, and this had decayed, leaving the margin of the ossified portion sharply defined. When fitted to a handle and properly prepared, I found it a very efficient tool, and was able to fill the wheelbarrow with it in two minutes; but as there was no evidence of this having been done by the prehistoric men, I think we must hesitate before accepting its use as a shovel by the miners here. It is true the spine was wanting in nearly all the blade-bones found, but was it cut off? or had it decayed? Some portions of bones decay more rapidly than others. The suggestion first put forward, I believe, by Mr. E. Willett is, however, ingenious, and as the bone is undoubtedly capable of being modified to the purpose, we may hope to find evidence of its having been so used hereafter, if it has not been obtained yet.

This concludes the record of our excavations up to the present time. Some points of interest have been clearly settled. The hill

\* Major Godwin Austen informs me that in the eastern parts of India, with which he is familiar as an officer of the Indian Survey, the hands are used more frequently than any kind of tool by the natives in filling baskets with earth.



was used by the miners before it was occupied for defence. Some at least of the shafts and galleries, and these not the earliest, were made before the entrenchment. Was it the value of the flint mines on the hill which led to its being entrenched? Are all the shafts anterior to the entrenchment, or may some of them be of later date? The cause of the exact coincidence of the boundary of the pits with the curved line of the entrenchment on the west side—a line determined, as I have already said, by tactical considerations—has yet to be determined.\* The mines are of the neolithic age, although some of the implements present forms connecting them with palæolithic forms. I have nothing to alter from what I said eight years ago upon this point. Does the occurrence of *Bos primigenius* and of wild animals chiefly in Mr. Tyndall's pit, and the absence of *Bos primigenius* in our more recently excavated shafts, imply an earlier date for the former, or is this difference in the fauna accidental? The entrenchment is probably of pre-Roman times, as its form indicates, and the excavations in its ditch and rampart appear to prove. That flints were still in use after its erection is probable, from the evidence adduced. There is no inherent improbability in this; the defensive works of the Mississippi valley, which most closely resemble those of our own camp period, were the works of a people who employed copper only as a malleable stone, and used obsidian for their tools and weapons. The defences of central America, of the Polynesian Islands, and of New Zealand, belong also to the age of stone. No bronze implement has been found in Cissbury, although I have formerly recorded the finding of one in the neighbouring but differently constructed camp of Highdown. No relic of Saxon date has been discovered, and the Romans, if they occupied it, cultivated it, as shown by their vineyard terraces in the interior of the camp, which would not have been there had they used it as a fort.

It is possible that the pits which I have described in other fortified camps on the Sussex Down, and especially those of Mount Caburn, near Lewes, may hereafter turn out to be the mouths of shafts; a further examination of these is desirable.

One clear line of conchological evidence has been drawn. Oysters, common in the rampart and in the ditch down to the very bottom, were, from causes very different, almost as little known to the miners as to ourselves, not one having been found in the filling of the shafts and galleries. I leave it to conchologists to decide upon the value of this point of evidence. The pottery of the different periods, represented upon the hill,

\* See also my remarks on the tactical outline of this and similar British camps, in the "Archæologia," vol. xlii., pp. 45 and 48.

has been determined; and last, though not least amongst the achievements of an heroic age, a committee of the Anthropological Institute has done some work. The funds liberally subscribed by the members have not been exceeded.

Whilst the framing of this report has naturally fallen to my lot, I must not fail to remind the members that we are greatly indebted to my colleague, Mr. Park Harrison, for the assistance that he has afforded me during a great part of the explorations. To his pencil is due the sketch of the section in No. 2 escarp shaft which accompanies this paper; to his careful superintendence of the workmen, to the facility with which he crept into sundry places which my dimensions did not enable me to penetrate with the same ease, and to his active co-operation with me throughout, the Institute is indebted for no small portion of the information contained in this report. To Professor Rolleston, for his advice and assistance; to Mr. Ballard, of Broadwater, for facilitating our excavations in many ways, and more especially for lending us our two best workmen, Guiles and Wady; to Mr. Tupper, the gamekeeper, for a helping hand on several occasions; and to Mr. Wisden, the owner of the property, for his hospitality, and the uniform kindness with which he has promoted our explorations, the committee are also greatly indebted. Several non-members of the Institute have joined us in our investigations; and the results of this our first attempt in the field of original research, will, I trust, encourage the Institute to continue similar explorations in years to come. I propose, on a future occasion, to offer to the Institute some remarks on the forms of the implements found in Cissbury at different times.

Models of the large pit and of the entrenchment, with the shafts and galleries beneath, made accurately to scale by Colonel Lane Fox, were exhibited at the meeting, and are now in his anthropological collection at Bethnal Green, together with the experimental tools employed to ascertain the mode of working the galleries. The plans and sections accompanying this paper are also drawn accurately to scale. Plates xv. and xvii. being on the same scale, enables a comparison to be made of the size of the two works.

The following are the animal remains found in the two pits, as determined by Professor ROLLESTON, F.R.S.:—

*Ancient Remains in Large Pit.*—Goat, *Capra hircus*; Horn cores; Roe, *Cervus capriolus*; Pig, *Sus scrofa* var. *domesticus*; Ox, *Bos longifrons*; Red Deer, *Cervus elaphus*; Horse, *Equus caballus*, teeth from superficial layers only.

*Ancient Remains in Skeleton Pit.*—Goat, *Capra hircus*; Roe,

*Cervus capriolus*; Fox, *Canis vulpes*; Pig, *Sus scrofa* var. *domesticus*. Four pigs of various ages, two very young, one only old, were represented in this pit; there were not by any means a large number of bones of this species. Shrew mice, voles, and toads were also represented by the bones found in this pit. Six species of snails were found in the Skeleton Pit, viz:—*Helix nemoralis* (numerous), *Helix lapicida*, *Helix rotundata*, *Helix arbustorum*, *Zonites cellaria*, *Cyclostoma elegans* (very numerous). Woman—*Homo sapiens*.—The skeleton, nearly entire, of a woman with a cephalic index of .75, and skull of a cubic capacity of 105 cubic inches.

There were no remains of *Bos primigenius* or wild boar in any of the shafts or galleries examined.

The following letter from Professor PRESTWICH was received by the President:—

"I told you on the spot what I thought of the interesting works over which you so kindly conducted us on Thursday last, and I have jotted down on paper the few conclusions which, after full consideration of the geological conditions, I am enabled to form, though I fear it is a very small geological contribution.

"1. The fact of some of the shafts opening under the rampart clearly shows the distinct and relative age of the two works—that the underground galleries and the shafts are older than the camp. 2. The *débris* with which the shafts were filled had evidently been freshly removed, and at once used at the time of filling, as the blocks of chalk, had they been exposed to the air for even one winter would have crumbled and fallen to pieces, and the small quantity of stiff red clay would have lost its pure colour and tenacious character.\* 3. There seems to have been a little, but not much, weathering of the sides of the shafts before the filling up took place. 4. The filling in the bottom of the ditch is due to weathering and rain-wash.

"While the shape of most of the flint implements is clearly neolithic, there are some which certainly approach very closely to palæolithic implements; but the use of horn, and the absence of all animal remains, except those of domestic animals and of wild boar and *Bos primigenius* sufficiently fix the former date.† It is, however, very interesting to find the old type still existing at that period, although apparently in process of

\* This remark of Mr. Prestwich's is fully confirmed by the rubble excavated from Mr. Willett's shaft, which having remained exposed on the surface for one year, has been weathered into a solid mass.—A. L. F.

† These animals, it will be remembered, were found in Mr. Tyndall's shaft, but not in any of the others.—A. L. F.

being superseded by the newer ones. It, in my opinion, carries back the age of the diggings to a period considerably anterior to that of the camp."

The President also communicated the following note by Mr. GODWIN AUSTEN, F.R.S., who visited the excavations with the party of distinguished scientists alluded to in the paper:—

"Cissbury Camp, Worthing, is an irregular earthwork, consisting of an outer bank, deep ditch, and a lofty inner bank. The interest attaching to the recent explorations at this place is the evidence brought out of successive change. Evidence of early occupation is indicated by a double row of equidistant, circular depressions along the hill-side, which run towards the camp, and are continued within its area. The recent excavations were made on the line of these depressions, and just where it crossed the earthworks. It may be mentioned that the surface at this place offered no indication of circular depressions, and the spot fixed upon was taken from its position with reference to the depressions outside. The excavation showed circular shafts or pits, several feet in depth, and which at bottom threw off low horizontal galleries. It was also ascertained that the circular depressions were connected with vertical pits and chambers.

"The close attention with which the exploration was pursued, and the use made of every scrap of evidence as it came out, entitle Col. Lane Fox and Mr. Harrison to great credit. In this way it became clear that the earthworks of the camp were thrown up subsequently to the formation of the lines of circular shafts and chambers and their resulting circular depressions. It also appeared to me as if the lower or outer bank was the first that was thrown up, and which is just such in its dimensions as are many of the single rings which occur in so many places over the chalk downs of the south-east of England, none of which can be considered as defensive works, unless they supported a palisade. The inner embankment conforms to the outer, and, from its magnitude, is an imposing work. A cross section of this, made by the explorers, seemed to suggest that, in its ultimate form, it was the result of two successive additions to its height.

"In form the Cissbury camp is not truly circular, as are so many of the earthworks of the early British people; but the object to be attained in this was to make the encampment include the series of vertical shafts, as important to the inmates of the camp. The purpose for which such excavations were made can be the subject of conjecture only; as yet they have not afforded any clue to this. The flint implements which have

been found in and about the area of Cissbury indicate that it is referable to an early British period. Considering the nature of the implements at the service of such a people, such shafts and galleries must have been great and laborious undertakings, having corresponding advantages, as connected with their means of living, such as winter underground retreats for themselves, after the manner of the cave people, for which the small galleries would be well suited, or else as storing-places for grain and provender, as was done underground by the Rhemi of Gaul, whence the early inhabitants of this part of England came. One thing is clear, that, whatever the original intention of these excavations may have been, there came a time when they were no longer needed, but were disused and finally filled in."

#### EXPLANATION OF PLATES XIV. TO XIX.

##### *Plate XIV.*

From Survey by Col. A. Lane Fox.

Fig. 1.—Plan of Cissbury Camp.

Fig. 2.—Section on line *C D*, across rampart.

Fig. 3.—Section on line *A B*, through large pit and rampart.

##### *Plate XV.*

From Survey by Col. A. Lane Fox.

Fig. 1.—Plan of galleries and shafts beneath ditch and rampart at Cissbury.

Fig. 2.—Section on line *A B*, through No. 1 escarp shaft.

Fig. 3.—Section on line *C D*, through skeleton shaft.

Fig. 4.—Section of ditch, showing layers of cutting and position of pottery and flakes.

##### *Plate XVI.*

Section through escarp pit No. 2 and ditch of Camp at Cissbury. From sketch by Mr. J. Park Harrison.

##### *Plate XVII.*

From Survey by Col. A. Lane Fox.

Fig. 1.—Plan of large pit at Cissbury.

Fig. 2.—Section on line *R T*, with south-west view.

Fig. 3.—Section on line *R T*, with north-east view.

##### *Plate XVIII.*

Fig. 1.—Mallet of deer horn, used for driving in the tine punches (fig. 3) and the wedges (fig. 2), showing marks of bruising, found in large pit; half-size.

Fig. 2.—Wedge of deer horn ground to an edge, found in large pit; half-size.



Fig. 3.—Punch formed of the tine of a deer horn, cut off with a flint at top, found in large pit; half-size.

Fig. 4.—Tine of deer horn, cut off at top with a flint, found in large pit; half-size.

Fig. 5.—Wedge of deer horn, cut with a flint at side, and showing marks of wear at the point, found in large pit; half-size.

Fig. 6.—Fragment of chalk, perforated by a hole bored from both sides, found in section of rampart; half-size.

Fig. 7.—Fragment of coarse pottery found in the silting of the large pit, beneath red seam; full size.

Fig. 8.—Fragment of brown pottery found in silting of large pit, beneath red seam; full size.

### Plate XIX.

Skull of female found with other remains in the skeleton shaft at Cissbury. From drawing furnished by Professor Rolleston, F.R.S.

Fig. 1.—Norma lateralis.

Fig. 2.—Norma verticalis.

Fig. 3.—Norma basilis.

Fig. 4.—Norma occipitalis.

Fig. 5.—Norma facialis.

### DISCUSSION.

MR. ERNEST WILLETT said: After the exhaustive manner in which your President has this evening both reviewed the past history of Cissbury, and given an account of the recent carefully prosecuted excavations, little remains to be said. But as one who has taken a great deal of interest, and given much thought to the Camp, I am glad to be here to-night to endorse fully his arguments as to the relative priority of the pits to the vallum. I stated, in conclusion of my paper on the subject read before the Society of Antiquaries in April, that this was a point it was most desirable to settle, and that it would require a considerable amount of time and work to do it. As this has been now done by the liberality of the Institute, and I think the facts demonstrated by the President, who so kindly undertook the superintendence of the work, beyond all reasonable doubt, it leaves little more, as far as our present inquiry extends, to be settled as to Cissbury.

LORD ROSEHILL believed he was in possession of several implements and other remains—found either in the pits he worked himself, or in the one worked by the late Mr. Tyndall—which were as yet undescribed, and unrepresented in the collection before the meeting. He would be glad to produce these specimens at some future meeting, if thought desirable, and at the same time add in any way in his power to the facts or information already produced by others in connection with this very interesting discovery.

Professor BOYD DAWKINS said that he had examined and made a list of the bones and teeth from the pit excavated in 1874 by Mr. Tyndall, which were shown him by that gentleman at Brighton, and he has a distinct recollection that among them there were domestic animals such as the goat.\* This pit, therefore, merely differed from those described by Colonel Lane Fox in presenting two wild animals not found in the former.

Mr. PARK HARRISON, Mr. FRANKS, and Professor ROLLESTON offered some remarks.

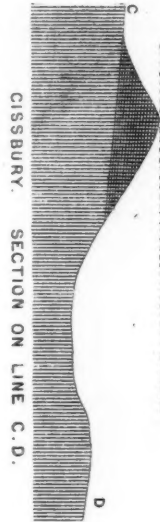
The author briefly replied.

A series of diagrams, two models, and a large collection of flint implements and animal remains, were exhibited in illustration of the paper. The meeting then separated.

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\* Note.—December 10, 1875.—List of species: urus (*Bos primigenius*), roe, stag, wild boar, badger, *Bos longifrons*, goat, dog. The above wild and domestic animals were in Mr. Tyndall's possession in August, 1874.

Fig. 2.



CISSBURY. SECTION ON LINE C.D.

- E. SECTION OF DITCH OPENED IN 1867
- F. DITCH OPENED IN APRIL 1875
- G. N. LINE OF PITTS OUTSIDE RAMPART
- H. TWO PITTS OPENED
- I. SECTION OF DITCH OPENED JUNE 1875
- K. M. WILLETTS' PIT
- L. M. TYNDALL'S PIT
- M. LARGE PIT
- N. ROMAN POTTERY FOUND ON SURFACE
- S. TERRACE PROBABLY FORMED BY CULTIVATION

Fig. 1.

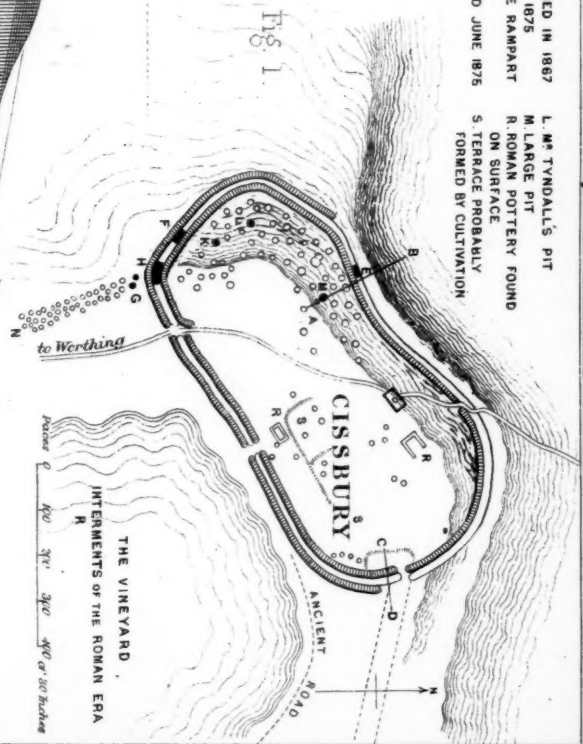
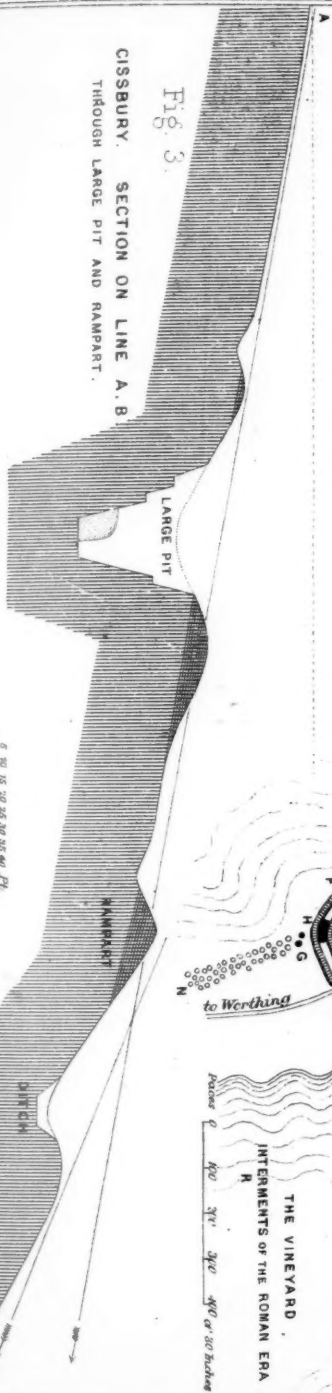


Fig. 3.

CISSBURY. SECTION ON LINE A.B. THROUGH LARGE PIT AND RAMPART.



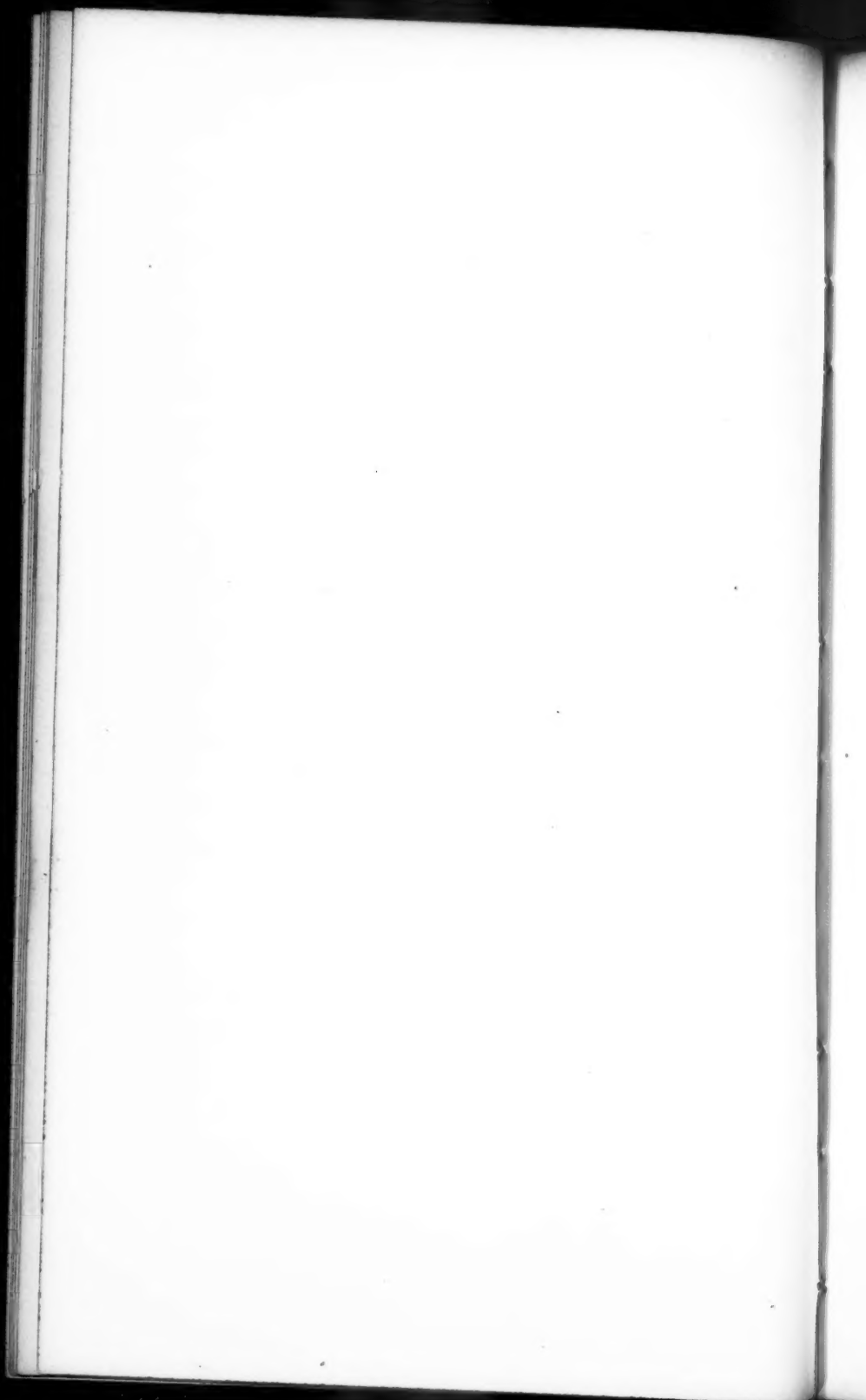


Fig. 3. SECTION ON THE LINE C.D. THROUGH SKELETON SHAFT.

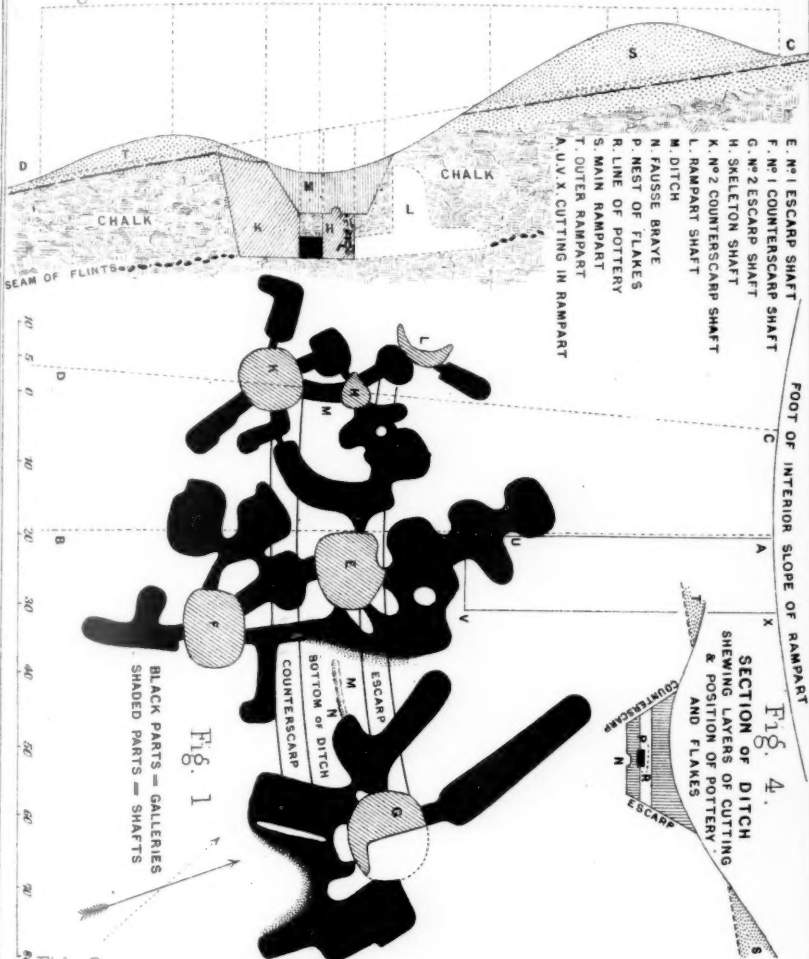
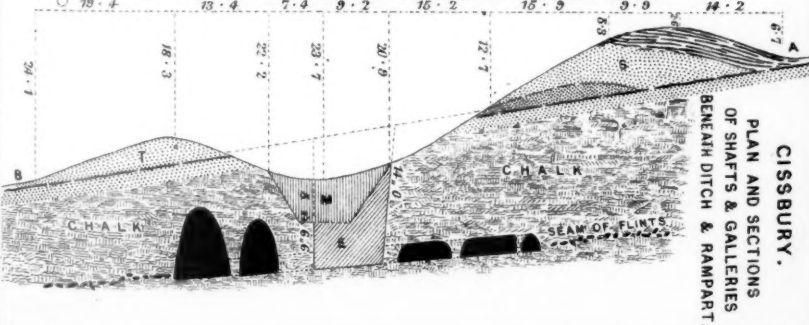


Fig. 1

BLACK PARTS = GALLERIES  
SHADED PARTS = SHAFTS

Fig. 2. SECTION ON THE LINE A.B. THROUGH N°1 ESCARP SHAFT



CISSBURY.

PLAN AND SECTIONS  
OF SHAFTS & GALLERIES  
BENEATH DITCH & RAMPART.

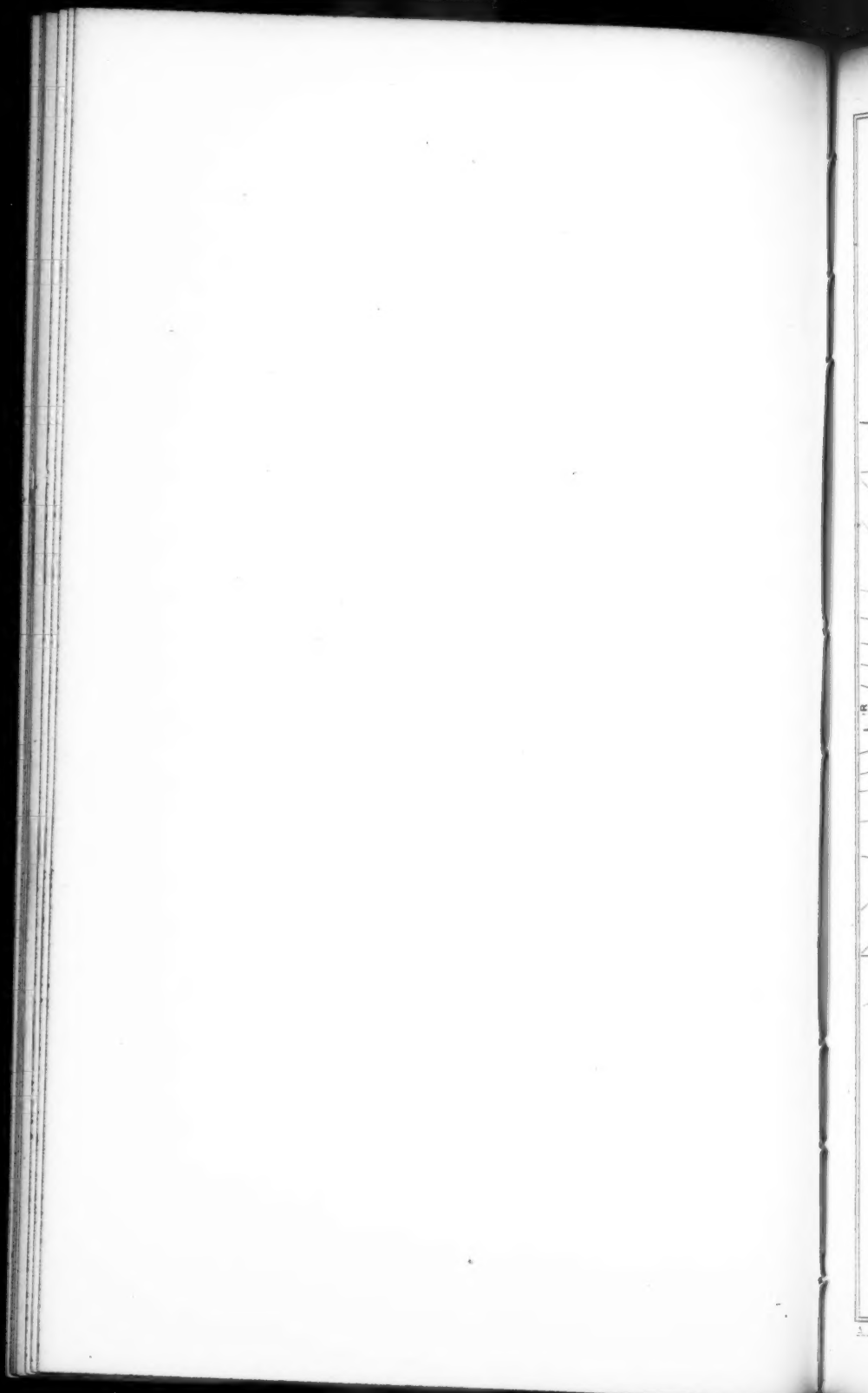






SECTION THROUGH ESCARP PIT (Nº2) AND DITCH OF CAMP CISSBURY.

C.F. Bell Lith. London, E.C.



CISSBURY.  
PLAN AND SECTION  
OF LARGE PIT.

- A.A. UPPER LEDGE
- B.B. CAVES
- C.C. SECOND LEDGE
- D. ENTRANCE TO GALLERY
- E. RED SEAM
- G. FIRST FILLING

- H. SECOND FILLING
- F.F. COARSE POTTERY
- K. RUBBLE NOT EXCAVATED
- L. MOUTH OF SMALL PIT
- M. PREHISTORIC REMBLAI
- N. BASIN OF PIT
- P. SEAMS OF FLINT

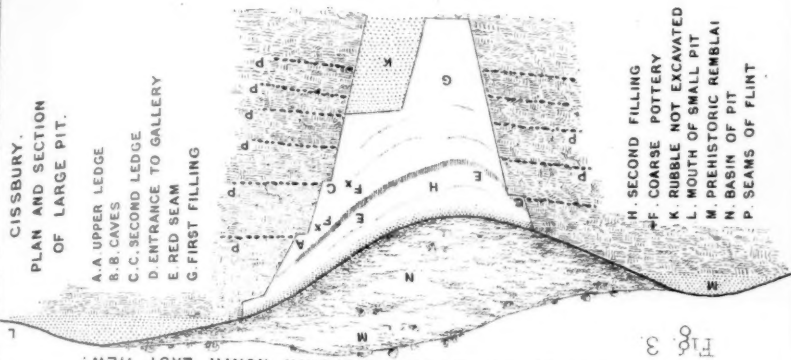


FIG. 3. SECTION ON THE LINE R.T. WITH NORTH EAST VIEW.

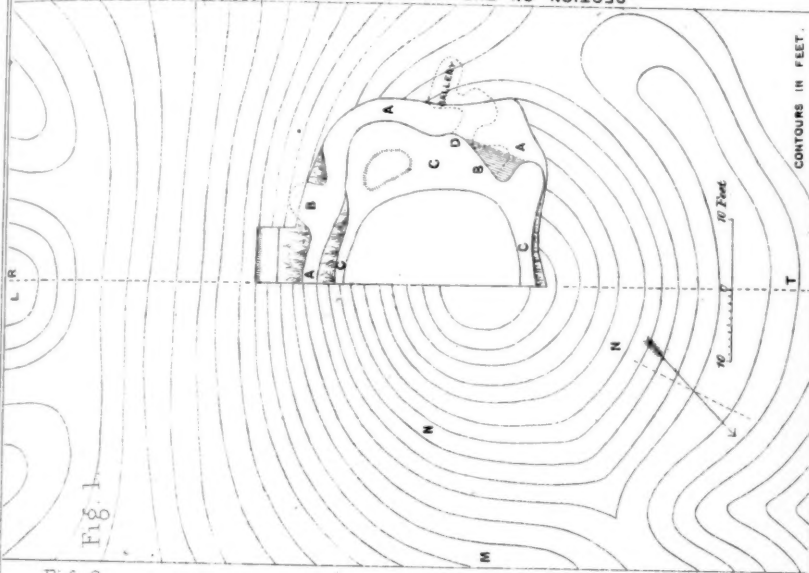
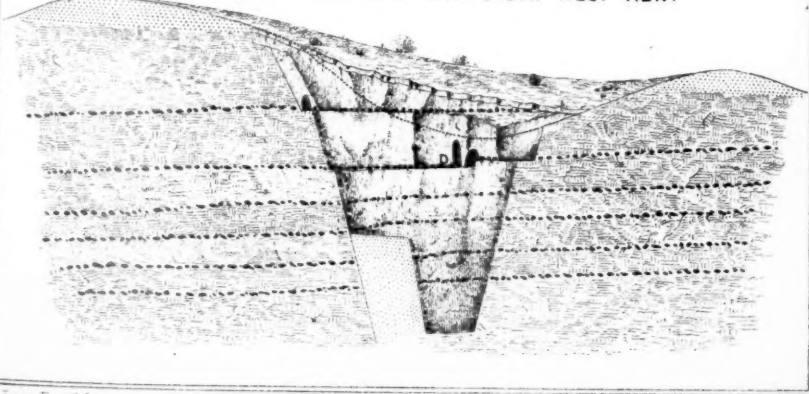


FIG. 1.

FIG. 2. SECTION ON THE LINE R.T. WITH SOUTH WEST VIEW.



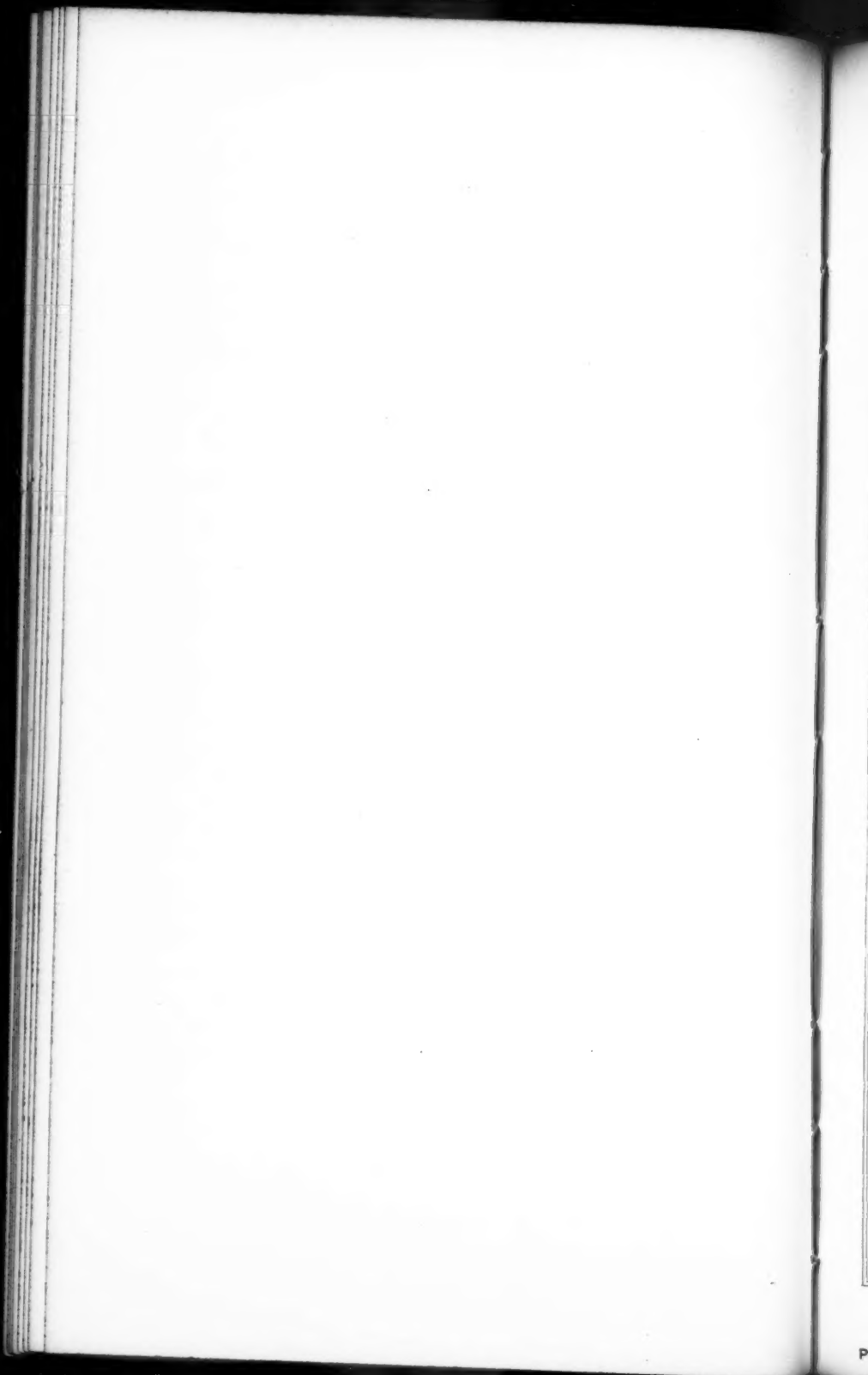




Fig. 1.



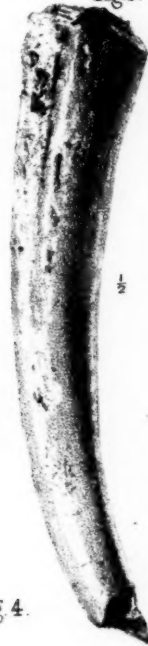
$\frac{1}{2}$

Fig. 2.



$\frac{1}{2}$

Fig. 3.



$\frac{1}{2}$

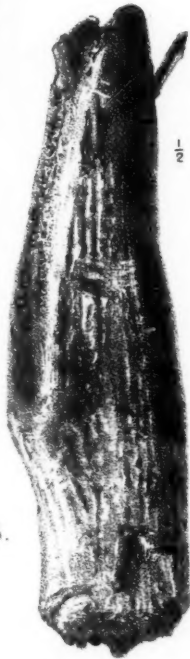
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Fig. 4.



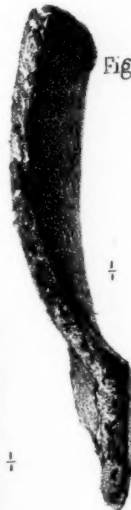
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Fig. 5.



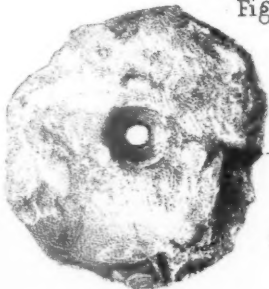
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Fig. 8.

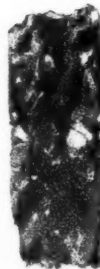


$\frac{1}{4}$

Fig. 6.



$\frac{1}{2}$

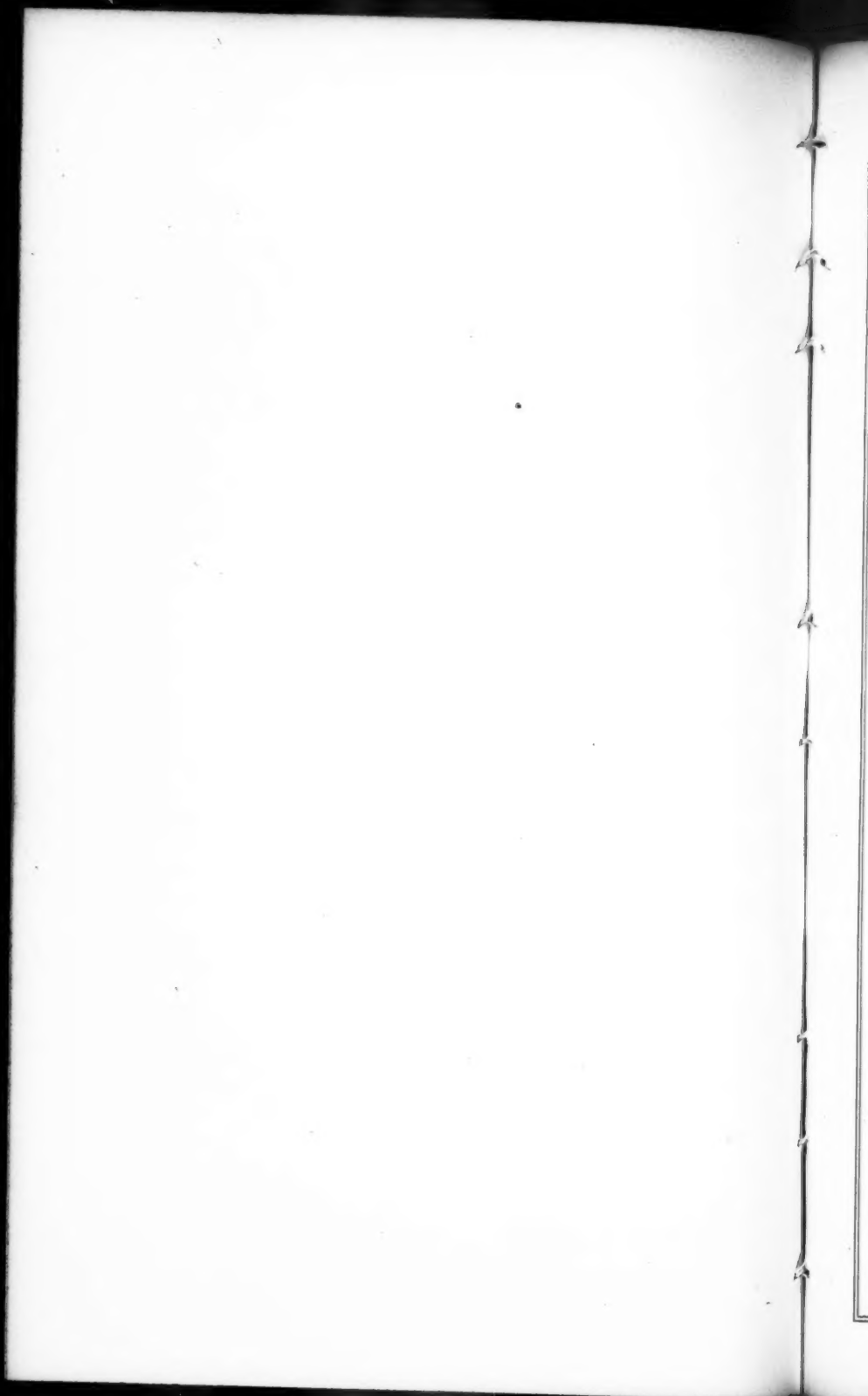


$\frac{1}{4}$

Fig. 7.

C. F. Kell Lith. London E. C.

IMPLEMENTS OF STAGS HORN. PIECE OF  
PERFORATED CHALK AND POTTERY FROM CISSBURY.



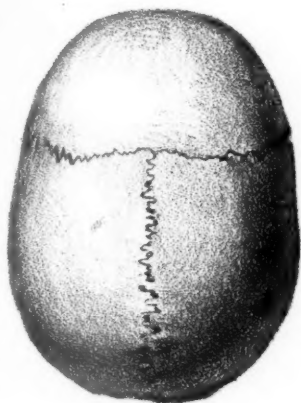


Fig. 2.

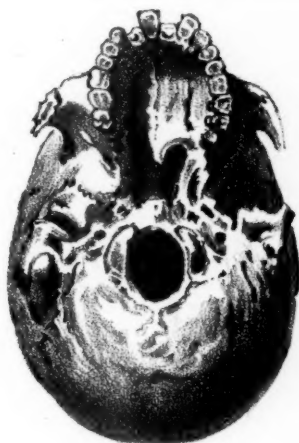


Fig. 3.

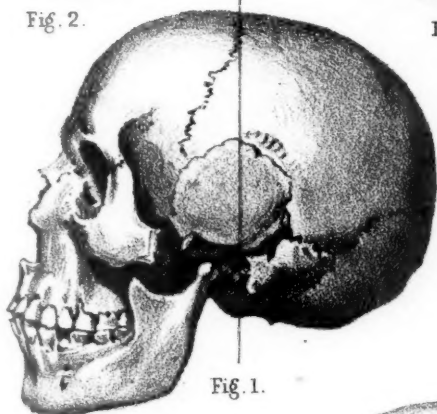


Fig. 1.

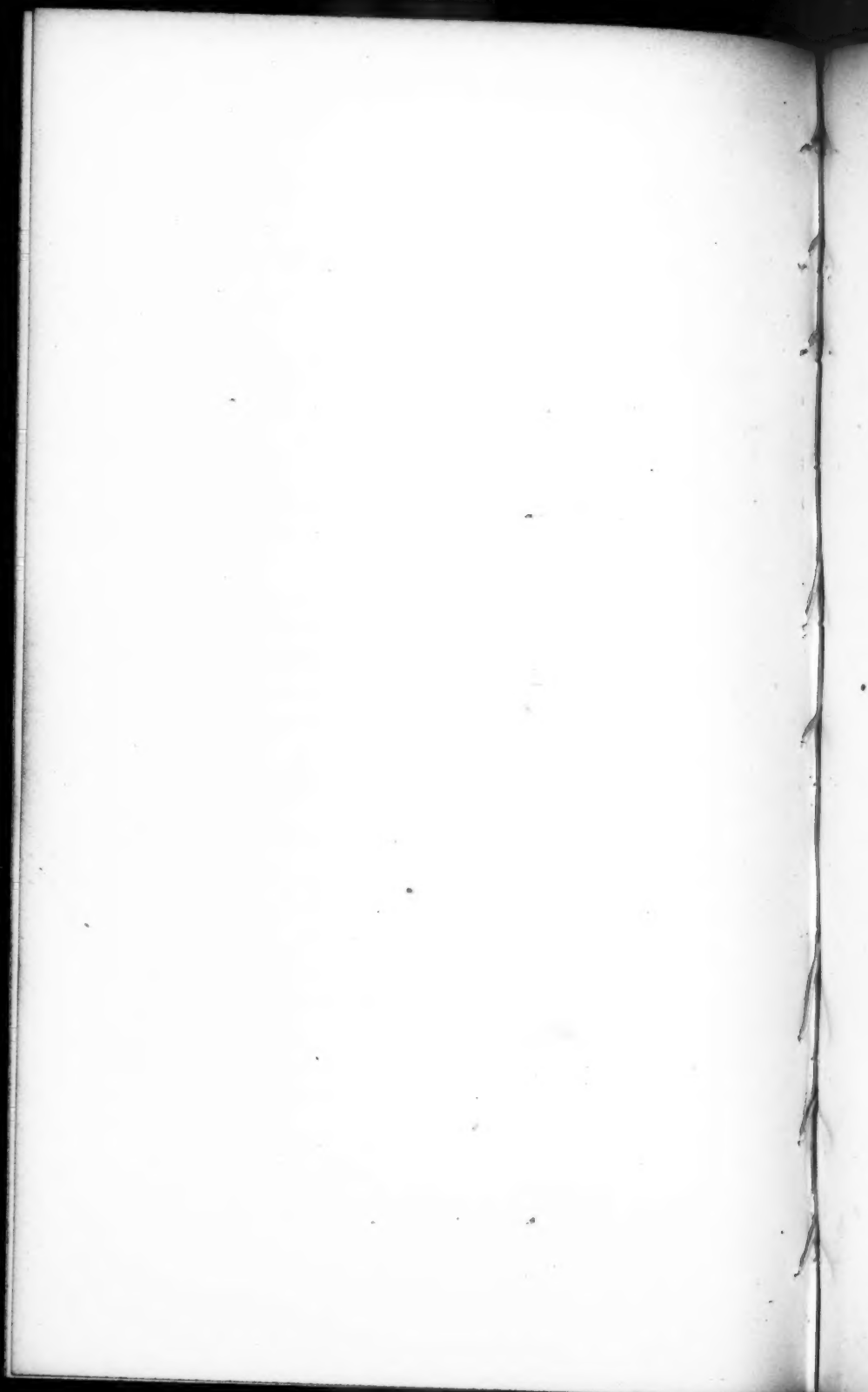


Fig. 4.



Fig. 5.

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## ANTHROPOLOGICAL MISCELLANEA.

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*The HISTORY of TWINS, as a Criterion of the RELATIVE POWERS of NATURE and NURTURE.* By FRANCIS GALTON, F.R.S.\*

THE exceedingly close resemblance attributed to twins has been the subject of many novels and plays, and most persons have felt a desire to know upon what basis of truth those works of fiction may rest. But twins have many other claims to attention, one of which will be discussed in the present memoir. It is, that their history affords means of distinguishing between the effects of tendencies received at birth, and of those that were imposed by the circumstances of their after lives; in other words, between the effects of nature and of nurture.† This is a subject of especial importance in its bearings on investigations into mental heredity, and I, for my part, have keenly felt the difficulty of drawing the necessary distinction whenever I tried to estimate the degree in which mental ability was, on the average, inherited. The objection to statistical evidence in proof of its inheritance has always been: "The persons whom you compare may have lived under similar social conditions and have had similar advantages of education, but such prominent conditions are only a small part of those that determine the future of each man's life. It is to trifling accidental circumstances that the bent of his disposition and his success are mainly due, and these you leave wholly out of account—in fact, they do not admit of being tabulated, and therefore your statistics, however plausible at first sight, are really of very little use." No method of inquiry which I have been able to carry out—and I have tried many methods—is wholly free from this objection. I have therefore attacked the problem from the opposite side, seeking for some new method by which it would be possible to weigh in just scales the respective effects of nature and nurture, and to ascertain their several shares in framing the disposition and intellectual ability of men. The life history of twins supplies what I wanted. We might begin by inquiring about twins who were closely alike in boyhood and

\* Reprinted, with revision and additions, from *Fraser's Magazine*, Nov. 1875.

† In my "English Men of Science," 1874, p. 12, I treated this subject in a cursory way. It subsequently occurred to me that it deserved a more elaborate inquiry, which I made, and of which this paper is a result.



youth, and who were educated together for many years, and learn whether they subsequently grew unlike, and, if so, what the main causes were which, in the opinion of the family, produced the dissimilarity. In this way we may obtain direct evidence of the kind we want. Again, we may obtain yet more valuable evidence by a converse method. We might inquire into the history of twins who were exceedingly unlike in childhood, and learn how far their characters became assimilated under the influence of identical natures, inasmuch as they had the same home, the same teachers, the same associates, and in every other respect the same surroundings.

My materials were obtained by sending circulars of inquiry to persons who were either twins themselves or the near relations of twins. The printed questions were in thirteen groups; the last of them asked for the addresses of other twins known to the recipient, who might be likely to respond if I wrote to them. This happily led to a continually widening circle of correspondence, which I pursued until enough material was accumulated for a general reconnaissance of the subject.

There is a large literature relating to twins in their purely surgical and physiological aspect. The reader interested in this should consult *Die Lehre von den Zwillingen*, von L. Kleinwächter, Prag. 1871. It is full of references, but it is also unhappily disfigured by a number of numerical misprints, especially in page 26. I have not found any book that treats of twins from my present point of view.

The reader will easily understand that the word "twins" is a vague expression, which covers two very dissimilar events—the one corresponding to the progeny of animals that have usually more than one young one at a birth, each of which is derived from a separate ovum, while the other is due to the development of two germinal spots in the same ovum. In the latter case, they are enveloped in the same membrane, and all such twins are found invariably to be of the same sex. The consequence of this is, that I find a curious discontinuity in my results. One would have expected that twins would commonly be found to possess a certain average likeness to one another; that a few would greatly exceed that degree of likeness, and a few would greatly fall short of it. But this is not at all the case. Extreme similarity and extreme dissimilarity between twins of the same sex, are nearly as common as moderate resemblance. When the twins are a boy and a girl, they are never closely alike; in fact, their origin is never due to the development of two germinal spots in the same ovum.

I have received about eighty returns of cases of close similarity, thirty-five of which entered into many instructive

details. In a few of these not a single point of difference could be specified. In the remainder, the colour of the hair and eyes were almost always identical; the height, weight, and strength were generally nearly so. Nevertheless, I have a few cases of a notable difference in these, although the resemblance was otherwise very near. The manner and address of the thirty-five pairs of twins is usually described as very similar, though there often exists a difference of expression, familiar to near relatives, but unperceived by strangers. The intonation of the voice when speaking is commonly the same, but it frequently happens that the twins sing in different keys. Most singularly the one point in which similarity is rare, is the handwriting. I can with difficulty account for this, considering how strongly handwriting runs in families, but I am sure of the fact. I have only one case in which nobody, not even the twins themselves, could distinguish their own notes of lectures, &c.; barely two or three in which the handwriting was undistinguishable by others, and only a few in which it was described as closely alike. On the other hand, I have many in which it is stated to be unlike, and some in which it is alluded to as the only point of difference. It would appear that the handwriting is a very delicate test of difference in organisation—a conclusion which I commend to the notice of enthusiasts in the art of discovering character by the handwriting.

One of my inquiries was for anecdotes as regards the mistakes made by near relatives, between the twins. The replies are numerous, but not very varied in character. When the twins are children, they have commonly to be distinguished by ribbons tied round their wrist or neck; nevertheless the one is sometimes fed, physicked, and whipped by mistake for the other, and the description of these little domestic catastrophes is usually given to me by the mother, in a phraseology that is somewhat touching by reason of its seriousness. I have one case in which a doubt remains whether the children were not changed in their bath, and the presumed A is not really B, and *vice versa*. In another case, an artist was engaged on the portraits of twins who were between three and four years of age; he had to lay aside his work for three weeks, and, on resuming it, could not tell to which child the respective likenesses he had in hand belonged. The mistakes are less numerous on the part of the mother during the boyhood and girlhood of the twins, but almost as frequent on the part of strangers. I have many instances of tutors being unable to distinguish their twin pupils. Two girls used regularly to impose on their music teacher when one of them wanted a whole holiday; they had their lessons at separate hours, and the one girl sacrificed herself to receive two

lessons on the same day, while the other one enjoyed herself. Here is a brief and comprehensive account:—"Exactly alike in all, their schoolmasters never could tell them apart; at dancing parties they constantly changed partners without discovery; their close resemblance is scarcely diminished by age." The following is a typical schoolboy anecdote:—"Two twins were fond of playing tricks, and complaints were frequently made; but the boys would never own which was the guilty one, and the complainants were never certain which of the two he was. One head master used to say he would never flog the innocent for the guilty, and another used to flog both." No less than nine anecdotes have reached me of a twin seeing his or her reflection in a looking-glass, and addressing it, in the belief it was the other twin in person. I have many anecdotes of mistakes when the twins were nearly grown up. Thus:—"Amusing scenes occurred at college when one twin came to visit the other; the porter on one occasion refusing to let the visitor out of the college gates, for, though they stood side by side, he professed ignorance as to which he ought to allow to depart."

Children are usually quick in distinguishing between their parent and his or her twin; but I have two cases to the contrary. Thus, the daughter of a twin says:—"Such was the marvellous similarity of their features, voice, manner, &c., that I remember, as a child, being very much puzzled, and I think, had my aunt lived much with us, I should have ended by thinking I had two mothers." In the other case, a father who was a twin, remarks of himself and his brother:—"We were extremely alike, and are so at this moment, so much so that our children up to five and six years old did not know us apart."

I have four or five instances of doubt during an engagement of marriage. Thus:—"A married first, but both twins met the lady together for the first time, and fell in love with her there and then. A managed to see her home and to gain her affection, though B went sometimes courting in his place, and neither the lady nor her parents could tell which was which." I have also a German letter, written in quaint terms, about twin brothers who married sisters, but could not easily be distinguished by them.\* In the well-known novel by Mr. Wilkie Collins of "Poor Miss Finch," the blind girl distinguishes the twin

\* I take this opportunity of withdrawing an anecdote, happily of no great importance, published in "Men of Science," p. 14, about a man personating his twin brother for a joke at supper, and not being discovered by his wife. It was told me on good authority; but I have reason to doubt the fact, as the story is not known to the son of one of the twins. However, the twins in questions were extraordinarily alike, and I have many anecdotes about them sent me by the latter gentleman.

she loves by the touch of his hand, which gives her a thrill that the touch of the other brother does not. Philosophers have not, I believe, as yet investigated the conditions of such thrills; but I have a case in which Miss Finch's test would have failed. Two persons, both friends of a certain twin lady, told me that she had frequently remarked to them that "kissing her twin sister was not like kissing her other sisters, but like kissing herself—her own hand for example."

It would be an interesting experiment for twins who were closely alike, to try how far dogs could distinguish between them by scent.

I have a few anecdotes of strange mistakes made between twins in adult life. Thus, an officer writes:—"On one occasion when I returned from foreign service my father turned to me and said, 'I thought you were in London,' thinking I was my brother—yet he had not seen me for nearly four years—our resemblance was so great."

The next and last anecdote I shall give is, perhaps, the most remarkable of those I have; it was sent me by the brother of the twins, who were in middle life at the time of its occurrence: "A was again coming home from India, on leave; the ship did not arrive for some days after it was due; the twin brother B had come up from his quarters to receive A, and their old mother was very nervous. One morning A rushed in, saying, 'Oh, mother, how are you?' Her answer was, 'No, B, it's a bad joke; you know how anxious I am!' and it was a little time before A could persuade her that he was the real man."

Enough has been said to prove that an extremely close personal resemblance frequently exists between twins of the same sex; and that, although the resemblance usually diminishes as they grow into manhood and womanhood, some cases occur in which the resemblance is lessened in a hardly perceptible degree. It must be borne in mind that the divergence of development, when it occurs, need not be ascribed to the effect of different natures, but it is quite possible that it may be due to the appearance of qualities inherited at birth, though dormant, like gout, in early life. To this I shall recur.

There is a curious feature in the character of the resemblance between twins, which has been alluded to by a few correspondents; it is well illustrated by the following quotations. A mother of twins says:—"There seemed to be a sort of interchangeable likeness in expression, that often gave to each the effect of being more like his brother than himself." Again, two twin brothers, writing to me, after analysing their points of resemblance, which are close and numerous, and pointing out certain shades of difference, add—"These seem to have marked

us through life, though for a while, when we were first separated, the one to go to business, and the other to college, our respective characters were inverted; we both think that at that time we each ran into the character of the other. The proof of this consists in our own recollections, in our correspondence by letter, and in the views which we then took of matters in which we were interested." In explanation of this apparent interchangeableness, we must recollect that no character is simple, and that in twins who strongly resemble each other, every expression in the one may be matched by a corresponding expression in the other, but it does not follow that the same expression should be the dominant one in both cases. Now it is by their dominant expressions that we should distinguish between the twins; consequently when one twin has temporarily the expression which is the dominant one in his brother, he is apt to be mistaken for him. There are also cases where the development of the two twins is not strictly *pari passu*; they reach the same goal at the same time, but not by identical stages. Thus:—A is born the larger, then B overtakes and surpasses A, and is in his turn overtaken by A, the end being that the twins become closely alike. This process would aid in giving an interchangeable likeness at certain periods of their growth, and is undoubtedly due to nature more frequently than to nurture.

Among my thirty-five detailed cases of close similarity, there are no less than seven in which both twins suffered from some special ailment or had some exceptional peculiarity. One twin writes that she and her sister "have both the defect of not being able to come downstairs quickly, which, however, was not born with them, but came on at the age of twenty." Three pairs of twins have peculiarities in their fingers; in one case it consists in a slight congenital flexure of one of the joints of the little finger; it was inherited from a grandmother, but neither parents, nor brothers, nor sisters show the least trace of it. In another case the twins have a peculiar way of bending the fingers, and there was a faint tendency to the same peculiarity in the mother, but in her alone of all the family. In a third case, about which I made a few inquiries, which is given by Mr. Darwin, but is not included in my returns, there was no known family tendency to the peculiarity in the twins of a crooked little finger. In another pair of twins, one was born ruptured, and the other became so at six months old. Two twins at the age of twenty-three were attacked by toothache, and the same tooth had to be extracted in each case. There are curious and close correspondences mentioned in the falling off of the hair. Two cases are mentioned of death from the same



disease; one of which is very affecting. The outline of the story was that the twins were closely alike and singularly attached, and had identical tastes; they both obtained Government clerkships, and kept house together, when one sickened and died of Bright's disease, and the other also sickened of the same disease and died seven months later.

In no less than nine out of the thirty-five cases does it appear that both twins are apt to sicken at the same time. This implies so intimate a constitutional resemblance, that it is proper to give some quotations in evidence. Either the illnesses were non-contagious in the instances to which I refer, or if contagious, they caught them simultaneously; they did not catch them the one from the other. Thus, the father of two twins says: "Their general health is closely alike; whenever one of them has an illness, the other invariably has the same within a day or two, and they usually recover in the same order. Such has been the case with whooping-cough, chicken-pox, and measles; also with slight bilious attacks, which they have successively. Latterly, they had a feverish attack at the same time." Another parent of twins says:—"If anything ails one of them, identical symptoms *nearly always* appear in the other; this has been singularly visible in two instances during the last two months. Thus, when in London, one fell ill with a violent attack of dysentery, and within twenty-four hours the other had precisely the same symptoms." A medical man writes of twins with whom he is well acquainted:—"Whilst I knew them, for a period of two years, there was not the slightest tendency towards a difference in body or mind; external influences seemed powerless to produce any dissimilarity." The mother of two other twins, after describing how they were ill simultaneously up to the age of fifteen, adds, that they shed their first milk teeth within a few hours of each other.

Trousseau has a very remarkable case (in the chapter on Asthma) in his important work "*Clinique Médicale*." (In the edition of 1873, it is in vol. ii. p. 473.) It was quoted at length in the original French, in Mr. Darwin's "*Variation under Domestication*," vol. ii. p. 252. The following is a translation:—

"I attended twin brothers so extraordinarily alike, that it was impossible for me to tell which was which, without seeing them side by side. But their physical likeness extended still deeper, for they had, so to speak, a yet more remarkable pathological resemblance. Thus, one of them, whom I saw at the Néothermes at Paris, suffering from rheumatic ophthalmia, said to me, 'At this instant my brother must be having an ophthalmia like mine;' and, as I had exclaimed against such an assertion, he showed me a few days afterwards a letter just

received by him from his brother, who was at that time at Vienna, and who expressed himself in these words—'I have my ophthalmia; you must be having yours.' However singular this story may appear, the fact is none the less exact; it has not been told to me by others, but I have seen it myself; and I have seen other analogous cases in my practice. These twins were also asthmatic, and asthmatic to a frightful degree. Though born in Marseilles, they were never able to stay in that town, where their business affairs required them to go, without having an attack. Still more strange, it was sufficient for them to get away only as far as Toulon in order to be cured of the attack caught at Marseilles. They travelled continually, and in all countries, on business affairs, and they remarked that certain localities were extremely hurtful to them, and that in others they were free from all asthmatic symptoms."

I do not like to pass over here a most dramatic tale in the "*Psychologie Morbide*" of Dr. J. Moreau (de Tours), Médecin de l'Hospice de Bicêtre. Paris, 1859, p. 172. He speaks "of two twin brothers who had been confined, on account of monomania, at Bicêtre. . . . Physically the two young men are so nearly alike that the one is easily mistaken for the other. Morally, their resemblance is no less complete, and is most remarkable in its details. Thus, their dominant ideas are absolutely the same. They both consider themselves subject to imaginary persecutions; the same enemies have sworn their destruction, and employ the same means to effect it. Both have hallucinations of hearing. They are both of them melancholy and morose; they never address a word to anybody, and will hardly answer the questions that others address to them. They always keep apart, and never communicate with one another. An extremely curious fact which has been frequently noted by the superintendents of their section of the hospital, and by myself, is this: From time to time, at very irregular intervals of two, three, and many months, without appreciable cause, and by the purely spontaneous effect of their illness, a very marked change takes place in the condition of the two brothers. Both of them, at the same time, and often on the same day, rouse themselves from their habitual stupor and prostration; they make the same complaints, and they come of their own accord to the physician, with an urgent request to be liberated. I have seen this strange thing occur, even when they were some miles apart, the one being at Bicêtre, and the other living at Saint-Anne." Dr. Moreau ranked as a very considerable medical authority, but I cannot wholly accept this strange story without fuller information. Dr. Moreau writes it in too off-hand a way to carry the conviction that he had investigated the circumstances

with the sceptic spirit and scrupulous exactness which so strange a phenomenon would have required. If full and precise notes of the case exist, they certainly ought to be published at length. I sent a copy of this passage to the principal authorities among the physicians to the insane in England, asking if they had ever witnessed any similar case. In reply, I have received three noteworthy instances, but none to be compared in their exact parallelism with that just given. The details of these three cases are painful, and it is not necessary to my general purpose that I should further allude to them.

There is another curious French case of insanity in twins, which was pointed out to me by Professor Paget, described by Dr. Baume in the "*Annales Médico-Psychologiques*," 4 série, vol. i. 1863, p. 312, of which the following is an abstract. The original contains a few more details, but is too long to quote: François and Martin, fifty years of age, worked as railroad contractors between Quimper and Châteaulin. Martin had twice had slight attacks of insanity. On January 15 a box in which the twins deposited their savings was robbed. On the night of January 23-4 both François (who lodged at Quimper) and Martin (who lived with his wife and children at St. Lorette, two leagues from Quimper) had the same dream at the same hour, three a.m., and both awoke with a violent start, calling out, "I have caught the thief! I have caught the thief! they are doing mischief to my brother!" They were both of them extremely agitated, and gave way to similar extravagances, dancing and leaping. Martin sprang on his grandchild, declaring that he was the thief, and would have strangled him if he had not been prevented; he then became steadily worse, complained of violent pains in his head, went out of doors on some excuse, and tried to drown himself in the River Steir, but was forcibly stopped by his son, who had watched and followed him. He was then taken to an asylum by gendarmes, where he died in three hours. François, on his part, calmed down on the morning of the 24th, and employed the day in inquiring about the robbery. By a strange chance, he crossed his brother's path at the moment when the latter was struggling with the gendarmes; then he himself became maddened, giving way to extravagant gestures and using incoherent language (similar to that of his brother). He then asked to be bled, which was done, and afterwards, declaring himself to be better, went out on the pretext of executing some commission, but really to drown himself in the River Steir, which he actually did, at the very spot where Martin had attempted to do the same thing a few hours previously.

The next point which I shall mention, in illustration of the extremely close resemblance between certain twins, is the

similarity in the association of their ideas. No less than eleven out of the thirty-five cases testify to this. They make the same remarks on the same occasion, begin singing the same song at the same moment, and so on; or one would commence a sentence, and the other would finish it. An observant friend graphically described to me the effect produced on her by two such twins whom she had met casually. She said: "Their teeth grew alike, they spoke alike and together, and said the same things, and seemed just like one person." One of the most curious anecdotes that I have received concerning this similarity of ideas was that one twin, A, who happened to be at a town in Scotland, bought a set of champagne glasses which caught his attention, as a surprise for his brother B; while, at the same time, B, being in England, bought a similar set of precisely the same pattern as a surprise for A. Other anecdotes of a like kind have reached me about these twins.

The last point to which I shall allude regards the tastes and dispositions of the thirty-five pairs of twins. In sixteen cases—that is, in nearly one-half of them—these were described as closely similar; in the remaining nineteen they were much alike, but subject to certain named differences. These differences belonged almost wholly to such groups of qualities as these: The one was the more vigorous, fearless, energetic; the other was gentle, clinging, and timid: or again, the one was more ardent, the other more calm and gentle: or again, the one was the more independent, original, and self-contained; the other the more generous, hasty, and vivacious. In short, the difference was that of intensity or energy in one or other of its protean forms; it did not extend more deeply into the structure of the characters. The more vivacious might be subdued by ill health, until he assumed the character of the other; or the latter might be raised by excellent health to that of the former. The difference was in the key-note, not in the melody.

It follows from what has been said concerning the similar dispositions of the twins, the similarity in the associations of their ideas, of their special ailments, and of their illnesses generally, that the resemblances are not superficial, but extremely intimate. I have only two cases altogether of a strong bodily resemblance being accompanied by mental diversity, and one case only of the converse kind. It must be remembered that the conditions which govern extreme likeness between twins are not the same as those between ordinary brothers and sisters (I have spoken of this in my memoir on the "Theory of Heredity," *Journal Anthropological Institute*, December, 1875, p. 329); and that it would be wholly incorrect to generalise from what has just been said about the twins, that mental and

bodily likeness are invariably co-ordinate, such being by no means the case.

We are now in a position to understand that the phrase "close similarity" is no exaggeration, and to realise the value of the evidence about to be adduced. Here are thirty-five cases of twins who were "closely alike" in body and mind when they were young, and who have been reared exactly alike up to their early manhood and womanhood. Since then the conditions of their lives have changed; what change of conditions has produced the most variation?

It was with no little interest that I searched the records of the thirty-five cases for an answer; and they gave an answer that was not altogether direct, but it was very distinct, and not at all what I had expected. They showed me that in some cases the resemblance of body and mind had continued unaltered up to old age, notwithstanding very different conditions of life; and they showed in the other cases that the parents ascribed such dissimilarity as there was wholly, or almost wholly to some form of illness. In four cases it was scarlet fever; in one case, typhus; in one, a slight effect was ascribed to a nervous fever; then I find effects from an Indian climate; from an illness (unnamed) of nine months' duration; from varicose veins; from a bad fracture of the leg, which prevented all active exercise afterwards; and there were three other cases of ill health. It will be sufficient to quote one of the returns; in this the father writes: "At birth they were *exactly* alike, except that one was born with a bad varicose affection, the effect of which had been to prevent any violent exercise, such as dancing or running, and, as she has grown older, to make her more serious and thoughtful. Had it not been for this infirmity, I think the two would have been as exactly alike as it is possible for two women to be, both mentally and physically; even now they are constantly mistaken for one another."

In only a very few cases is there some allusion to the dissimilarity being partly due to the combined action of many small influences, and in none of the 35 cases is it largely, much less wholly, ascribed to that cause. In not a single instance have I met with a word about the growing dissimilarity being due to the action of the firm freewill of one or both of the twins, which had triumphed over natural tendencies; and yet a large proportion of my correspondents happen to be clergymen whose bent of mind is opposed, as I feel assured from the tone of their letters, to a necessitarian view of life.

It has been remarked that a growing diversity between twins may be ascribed to the tardy development of naturally diverse qualities; but we have a right, upon the evidence I have



received, to go further than this. We have seen that a few twins retain their close resemblance through life; in other words, instances do exist of an apparently thorough similarity of nature, in which external circumstances do not create dissimilarity. Positive evidence, such as this, cannot be outweighed by any amount of negative evidence. Therefore, in those cases where there is a growing diversity, and where no external cause can be assigned either by the twins themselves or by their family for it, we may feel sure that it must be chiefly or altogether due to a want of thorough similarity in their nature. Nay, further, in some cases it is distinctly affirmed that the growing dissimilarity can be accounted for in no other way. We may therefore broadly conclude that the only circumstance, within the range of those by which persons of similar conditions of life are affected, capable of producing a marked effect on the character of adults, is illness or some accident which causes physical infirmity. The twins who closely resembled each other in childhood and early youth, and were reared under not very dissimilar conditions, either grow unlike through the development of natural characteristics which had lain dormant at first, or else they continue their lives, keeping time like two watches, hardly to be thrown out of accord except by some physical jar. Nature is far stronger than nurture within the limited range that I have been careful to assign to the latter.

The effect of illness, as shown by these replies, is great, and well deserves further consideration. It appears that the constitution of youth is not so elastic as we are apt to think, but that an attack, say of scarlet fever, leaves a permanent mark, easily to be measured by the present method of comparison. This recalls an impression made strongly on my mind several years ago, by the sight of some curves drawn by a mathematical friend. He took monthly measurements of the circumference of his children's heads during the first few years of their lives, and he laid down the successive measurements on the successive lines of a piece of ruled paper, by taking the edge of the paper as a base. He then joined the free ends of the lines, and so obtained a curve of growth. These curves had, on the whole, that regularity of sweep that might have been expected, but each of them showed occasional halts, like the landing places on a long flight of stairs. The development had been arrested by something, and was not made up for by after growth. Now, on the same piece of paper my friend had also registered the various infantine illnesses of the children, and corresponding to each illness was one of these halts. There remained no doubt in my mind that, if these illnesses had been warded off, the development of the children would have been increased by

almost the precise amount lost in these halts. In other words, the disease had drawn largely upon the capital, and not only on the income, of their constitutions. I hope these remarks may induce some men of science to repeat similar experiments on their children of the future. They may compress two years of a child's history on one side of a ruled half-sheet of foolscap paper, if they cause each successive line to stand for a successive month, beginning from the birth of the child; and if they mark off the measurements by laying, not the 0-inch division of the tape against the edge of the pages, but, say, the 10-inch division—in order to economise space.

The steady and pitiless march of the hidden weaknesses in our constitutions, through illness to death, is painfully revealed by these histories of twins. We are too apt to look upon illness and death as capricious events, and there are some who ascribe them to the direct effect of supernatural interference, whereas the fact of the maladies of two twins being continually alike, shows that illness and death are necessary incidents in a regular sequence of constitutional changes, beginning at birth, upon which external circumstances have, on the whole, very small effect. In cases where the maladies of the twins are continually alike, the clocks of their two lives move regularly on, and at the same rate, governed by their internal mechanism. When the hands approach the hour mark, there are sudden clicks, followed by a whirring of wheels; the moment that they touch it, the strokes fall. Necessitarians may derive new arguments from the life histories of twins.

We will now consider the converse side of our subject, which appears to me even the more important of the two, though I had little suspected it would be so, when I first began the inquiry. Hitherto we have investigated cases where the similarity at first was close, but afterwards became less; now we will examine those in which there was great dissimilarity at first, and will see how far an identity of nurture in childhood and youth tended to assimilate them. As has been already mentioned, there is a large proportion of cases of sharply contrasted characteristics, both of body and mind, among twins. I have twenty such cases, given with much detail. It is a fact that extreme dissimilarity, such as existed between Esau and Jacob, is a no less marked peculiarity in twins of the same sex, than extreme similarity. On this curious point, and on much else in the history of twins, I have many remarks to make, but this is not the place to make them.

The evidence given by the twenty cases above mentioned is absolutely accordant, so that the character of the whole may be exactly conveyed by two or three quotations. One parent

says: "They have had *exactly the same nurture* from their birth up to the present time; they are both perfectly healthy and strong, yet they are otherwise as dissimilar as two boys could be, physically, mentally, and in their emotional nature." Here is another case: "I can answer most decidedly that the twins have been perfectly dissimilar in character, habits, and likeness from the moment of their birth to the present time, though they were nursed by the same woman, went to school together, and were never separated till the age of fifteen." Here again is one more, in which the father remarks: "They were curiously different in body and mind from their birth." The surviving twin (a senior wrangler of Cambridge) adds: "A fact struck all our school contemporaries, that my brother and I were complementary, so to speak, in point of ability and disposition. He was contemplative, poetical, and literary to a remarkable degree, showing great power in that line. I was practical, mathematical, and linguistic. Between us we should have made a very decent sort of a man." I could quote others just as strong as these, in some of which the word "complementary" again appears, while I have not a single case in which my correspondents speak of originally dissimilar characters having become assimilated through identity of nurture. The impression that all this evidence leaves on the mind is one of some wonder whether nurture can do anything at all, beyond giving instruction and professional training. It emphatically corroborates and goes far beyond the conclusions to which we had already been driven by the cases of similarity. In these, the causes of divergence began to act about the period of adult life, when the characters had become somewhat fixed; but here the causes conducive to assimilation began to act from the earliest moment of the existence of the twins, when the disposition was most pliant, and they were continuous until the period of adult life. There is no escape from the conclusion that nature prevails enormously over nurture when the differences of nurture do not exceed what is commonly to be found among persons of the same rank of society and in the same country. My only fear is, that my evidence seems to prove too much, and may be discredited on that account, as it seems contrary to all experience that nurture should go for so little. But experience is often fallacious in ascribing great effects to trifling circumstances. Many a person has amused himself with throwing bits of stick into a tiny brook and watching their progress; how they are arrested, first by one chance obstacle, then by another; and again, how their onward course is facilitated by a combination of circumstances. He might ascribe much importance to each of these events, and think how largely the destiny of the stick

had been governed by a series of trifling accidents. Nevertheless all the sticks succeed in passing down the current, and they travel, in the long run, at nearly the same rate. So it is with life, in respect to the several accidents which seem to have had a great effect upon our careers. The one element, which varies in different individuals, but is constant in each of them, is the natural tendency; it corresponds to the current in the stream, and inevitably asserts itself.

Much stress is laid on the persistence of moral impressions made in childhood, and the conclusion is drawn, that the effects of early teaching generally, must be important in a corresponding degree. I acknowledge the fact, but doubt the deduction. The child is usually taught by its parents, and their teachings are of an exceptional character, for the following reason. There is commonly a strong resemblance, owing to inheritance, between the dispositions of the child and its parents. They are able to understand the ways of one another more intimately than is possible to persons not of the same blood, and the child instinctively assimilates the habits and ways of thought of its parents. Its disposition is "educated" by them, in the true sense of the word; that is to say, it is evoked earlier than it would otherwise have been. On these grounds, I ascribe the persistence of habits that date from the early periods of home education, to the peculiarities of the instructors, rather than to the period when the instruction was given. The marks left on the memory by the instructions of a foster-mother are soon spunged clean away. Consider the history of the cuckoo, which is reared exclusively by foster-mothers. It is probable that nearly every young cuckoo, during a series of many hundred generations, has been brought up in a family whose language is a chirp and a twitter. But the cuckoo cannot or will not adopt that language, or any other of the habits of its foster-parents. It leaves its birthplace as soon as it is able, and finds out its own kith and kin, and identifies itself henceforth with them. So completely is its change of life carried out, and so utterly are its earliest instructions in an alien bird-language neglected, that the note of the cuckoo tribe is singularly correct. Mr. Romanes tells me that he has compared the cuckoo's note with a tuning-fork, at home and abroad, and has found it to be identically the same in both cases.

Much might finally be said in qualification of the broad conclusions to which we have arrived, as to certain points in which education appears to create a permanent effect, partly by training the intellect, and partly by subjecting the boy to a higher or lower tone of public opinion; but this is foreign to my immediate object. The latter has been to show broadly,

and, I trust, convincingly, that statistical estimation of natural gifts by a comparison of successes in life, is not open to the objection stated at the beginning of this memoir. We have only to take reasonable care in selecting our statistics, and then we may safely ignore the many small differences in nurture which are sure to have characterised each individual case.

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